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ENGINEERING AND
MINING JOURNAL-PRESS
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Concreting United Verde's shaft by the ring method (described on page 329). Three sets of forms are shown after pouring has been finished

Kirkland Lake: Ontario's Second Gold District, by Edward H. Orser — Shaft Concreting by the Ring Method, by W. V. De Camp — Magnetometric Surveying as an Aid in Exploring Placer Ground, by King C. Laylander — New York Meeting of American Institute of Mining and Metallurgical Engineers — Biography of Samuel A. Taylor, the Institute's New President

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Volume 121 February 20, 1926 *Number* 8

ENGINEERING AND MINING JOURNAL-PRESS

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How Large Is the Mining Market?

IT IS A BIG JOB to estimate the number of conveyors, motors, shovels, hoists, cars, and the hundreds of other items of equipment purchased each year by the mining industry; however, it is interesting and significant to know that—

The largest fan ever manufactured is ventilating a deep mine in South Africa.

The biggest power plant in the world is now being built by a mining company (800,000 hp.).

Until recently the largest Diesel engines were those owned and operated by a mining company in Arizona.

IT IS DIFFICULT to conceive of pumps larger than those operated by mining companies, chimneys higher than those found at smelters, or motors larger than those driving the huge hoists at deep shafts.

THOUGH these facts do not answer the manufacturer's questions as to the size of the mining market, they do indicate that such equipment has a big place in mining.

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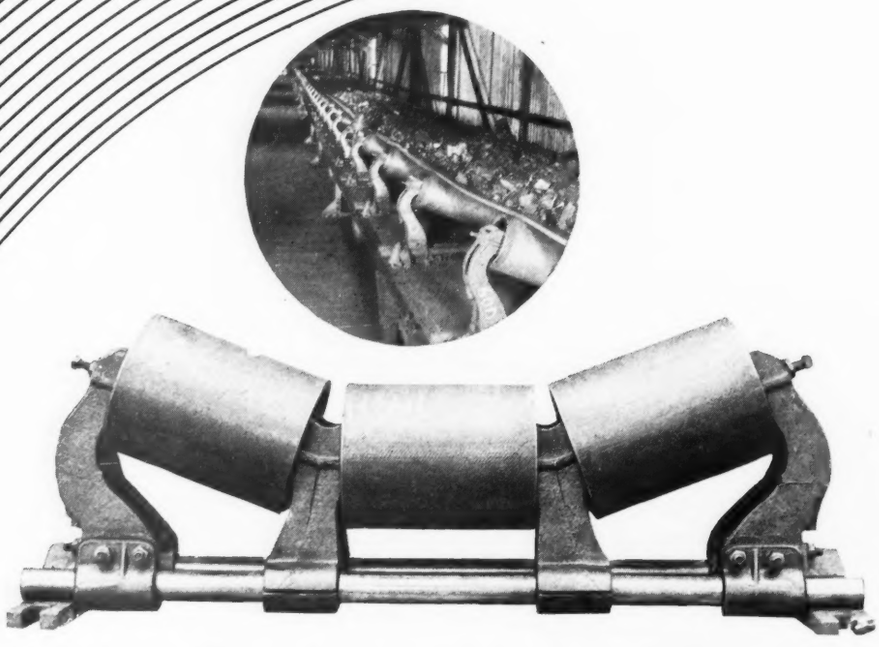

"444"—the important numerals in belt transportation

With conveyors now being built up to thousands of feet in length, engineers are giving more and more attention to the design of the carriers which they specify.

This new "444" Carrier is entirely in line with this new-day policy in belt transportation. It runs so smoothly and easily it is astonishingly economical of power, compared with former standards.

The tip-over feature, by which any carrier unit can be removed temporarily from service, without stopping the operation of the conveyor, is only one of its attractive points. Other features are strength due to high grade materials, ease and economy of upkeep and its long service life. The "444" is in use on the longest conveyor in the world—4½ miles.

Where good carriers are needed engineers will profitably bear in mind the number, "444" built by S-A.

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ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 121 New York, February 20, 1926 *Number* 8

The Mining Journal-Press

Engineering and Mining Journal-Press is a consolidation of *Engineering and Mining Journal* and *Mining and Scientific Press*, effective April 1, 1922.

Engineering and Mining Journal was founded in 1866 as the *American Journal of Mining*, with George Francis Dawson as Editor. In 1869 the name was changed to *Engineering and Mining Journal*.

Publications which have been absorbed are: 1875, *Coal and Iron Record;* 1877, *The Mining Review* (Denver); 1879, *The Polytechnic Review;* 1902, *Mining and Metallurgy;* 1906, *Mining Magazine;* 1917, *Engineering and Mining World.* The successive editors have been Rossiter W. Raymond, Richard P. Rothwell, Fred Hobart, David T. Day, T. A. Rickard, and W. R. Ingalls. In 1919 J. E. Spurr became Editor.

The *Mining and Scientific Press* was established in 1860 as the *Scientific Press.* Three years later "Mining" was added to the title. The successive editors have been Almond D. Hodges, Charles G. Yale, J. F. Holloran, T. A. Rickard, and H. Foster Bain.

The staff of the *Engineering and Mining Journal-Press* consists of J. E. Spurr, Editor-in-Chief; T. A. Rickard, Contributing Editor, San Francisco, Calif.; George J. Young, Associate Editor, San Francisco, Calif.; A. H. Hubbell, Managing Editor; E. H. Robie, A. B. Parsons, A. H. Fay, W. N. P. Reed, Assistant Editors.

Copper Refining on the Pacific Coast

AGITATION for the establishment of another copper refinery on the Pacific Coast, there being one already at Tacoma, is being made by the Los Angeles Chamber of Commerce. The initial suggestion was made several years ago by *Engineering and Mining Journal-Press*, but the publication of the graph showing the flow of American copper, on the cover of our 56th Annual Review, is principally responsible for the present discussion, which has been featured by the *Los Angeles Times.* As will be noted by reference to the cover of the Annual Review of Jan. 17, 1925, blister copper from Arizona and New Mexico is transported to Galveston and then by boat to the Eastern refineries, from which it enters domestic industry and part is shipped to Europe. Arguments in favor of Los Angeles as a possible site for a copper refinery are the relatively short haul to the Pacific Coast and the availability of ocean transportation from Los Angeles harbor to Europe via Panama. Hydro-electric and steam power are available as well as both oil and gaseous fuel.

It now takes about three weeks for copper shipped from Arizona points via Galveston to reach Eastern refineries, and this time would be probably more than doubled via Los Angeles and Panama, although no doubt a cheaper rate would be available. One important objection to the Los Angeles refinery project is the lack of copper-fabricating plants in the Pacific region, although some copper is now fabricated and the Coast generally absorbs a considerable amount of copper. The market for copper products bears some relation to population, and when considered upon this basis the disparity between the Pacific Coast and the great industrial area of the East is apparent. The tendency for metal refineries is toward marketing and distributing centers, and this explains why the present refineries center at important cities on the Atlantic seaboard.

It is not unlikely that Los Angeles will eventually get a copper refinery, for some of the copper-mining interests may work out a combination that may effect a saving in costs through the availability of such a refinery. Nevertheless, it is not reasonable to expect that long-established refineries will easily relinquish their business, and if a competitive refinery is established in the West, a readjustment of present charges may be made and no doubt will be advantageous to copper producers.

Skitterers and Twitterers

IN THE OLDEN DAYS a man of science could be expert on all the natural sciences from botany to astronomy; he might also be a mathematician and philosopher. The cultured man knew his literature, author by author, and even line by line; and his politics from Disraeli to Machiavelli. It must have been great to have been an educated man in those days! especially as most people had little claim on culture. The worst feature, of course, was that the ruling class—the governing overlords—despised scientific advance and culture far more even than they do now, which is, in the end, considerable.

All these things have changed. Science has ramified amazingly—specialists have necessarily multiplied, and journals of information. What shall an ambitious scholar or gentleman be, broad or narrow? Shall he be an all-round man of the world, or a despised plugger, whether he plugs at making cigars or investigating the use of the iota in the Hellenic writings? Certainly the former; therefore, scientists cut their hair and smoke cigars and clip their speech in the careless idiomatic fashion of the day. And there arises a considerable congregation of men who, intensely seeking for self-improvement, take on more and more information and acquaintances and feverishly try to keep abreast. This gives rise to the modern group of skitterers and twitterers. Their coat-of-arms is the water spider quartered with the sparrow, and you know them by their alert and nervous and prehensile manner. Theirs has been called the current-event mind—but they are much more far-flung mentally than that implies. So great is the multiplication of the ranks of this group that they promise to dominate the business, thought, and affairs of the coming century, for they have a certain nervous and delicate touch with many things which the quieter and slower and profounder individual has not.

All newspapers and most magazines are exponents of Skitterism and Twitterism; newspaper reporters are members ex-officio, and all members of Congress; editors, of course, belong. Indeed, although the group does not need to organize, it would seem more dignified that they should do so and more appropriate, for they are themselves great organizers of everything and are great committeemen. Let us suggest, then, the Society of Skitterers and Twitterers of America, to meet when

Power *and* Heating Efficiently Combined

The Power Plant of the Ford factory at Ford City, Ontario, economically combines power production throughout the year with winter heating.

Allis-Chalmers Steam Turbine Units were chosen for this unusual combination.

The two units of 10,000 K.W. and 5,000 K.W. rating operate normally condensing but when heat is required the smaller unit operates with reduced vacuum, the warm circulating water delivering heat to the Plant.

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Saw Mill Machinery
Air Compressors
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Steam and Electric Hoists
Farm Tractors
Power Transmission Machinery
Timber Preserving Machinery

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corresponding national societies are formed, in an International Convention. All those who talk but do not think, who absorb and appropriate ideas but do not originate them, who write but do not read, all skimmers and flashers, and scintillators—provided always they belong in the super class and have a college education to show for it—should be eligible for this organization, and should profit by the myriad mutual reflection of sparkling facets.

Repeal of the Capital Stock Tax

A GOOD STEP FORWARD has been made by the U. S. Senate, not so much in repealing the capital stock tax as in combining it with the income tax, thus eliminating duplication of work on the part of the taxpayer as well as on behalf of the government. So long as it is necessary to raise a specified sum for government purposes, it should be done by one operation instead of two, as has been the practice for a number of years. The capital stock tax is an excise tax, a charge on the privilege of doing business, and is calculated at the rate of $1 per thousand dollars on the fair value of the capital stock. It is payable in advance in July for the following fiscal year ending June 30, and yields about $95,000,000 per year. The Senate did not feel that this amount could be entirely eliminated at present and did the next best thing by increasing the income tax on corporations 1 per cent, making the new rate 13½ per cent in place of 12½ per cent, as in the 1924 law, and repealed the capital stock tax without substantial loss to the government.

Under the 1924 law the corporation has to run the two fiscal years contemporaneously, one on a calendar-year basis for income tax purposes and one expiring six months later for capital stock tax returns. On July 1 it makes the return for capital stock tax and has to strike a balance sheet to show not only its earnings but the estimated value of all its property and the estimated value of its stocks from time to time during the previous year. The government, with another set of auditors and another set of examiners, in a different division in the bureau, calculates the estimated fair value of the capital stock of that company and assesses the capital stock tax. Under the present law the income tax unit audits another set of returns filed on March 15, by the same corporation, on a calendar-year basis, and has an independent corps of field auditors who examine the records at the corporation's home office. Under the amendment as it passed the Senate, the taxpayer will make only one return; will audit his accounts once instead of twice for tax purposes, place only one value on his holdings, and have one fiscal year in the place of two, thus saving a large amount of clerical work and annoyance. Each corporation now goes through twice as much accounting and the government itself goes through twice as much auditing as is necessary to get the two taxes for the year out of the corporation.

Whether the corporation is large or small it should welcome this change in the matter of reducing its own expenses as well as the government's expenses in administering the law. Reduced government costs should in the long run mean further tax reduction.

Valuations set up and accepted for capital stock tax purposes and those set up for the income tax purposes are often the cause of delay in settlement of income taxes. Income tax auditors maintain that the sworn valuations set up for capital stock purposes should be the value upon which depletion should be based. The taxpayer, however, is not satisfied with this arrangement; hence opportunity for "bargaining" a settlement.

To assure that the capital stock tax may be low, an undervaluation is often made, while a high value is insisted upon for income tax purposes when establishing depletion and depreciation deductions. There can be only one true value, and this value should maintain in both cases. One of the causes of delay in closing tax cases is thus removed.

Consolidation of the two taxes is an advantage to any corporation as well as the government. For corporations earning 10 per cent it means practically no change in the amount of taxes paid, and for those earning in excess of 10 per cent on the fair valuation of the capital stock it means a slight increase in taxes which will in a large measure be offset by reduced expense in filing one return in place of two as at present. Corporations with no income will pay no tax. On the whole, however, it will eventually mean a slight reduction in taxes, and a great saving to the government in the matter of administration.

Duplication of work in the government bureaus is an important cause for maintaining high taxes. As soon as work becomes current, the capital stock tax unit can and should be discontinued. Any steps that will simplify or eliminate duplication of effort in government bureaus should be hailed with gratification on the part of all taxpayers.

Misuse of Newspapers in Mine Promotion

CERTAIN TYPES OF NEWSPAPERS lend their advertising space to unrestrained mine promotion which in the great majority of instances results in financial loss to their readers, who are either ignorant or susceptible enough to accept the bait set forth with unbridled restraint and a cunning disregard of obvious facts. Latest to be noted is an advertisement in a Los Angeles newspaper by C. C. Julian, who has flown high and wide in the promotion of oil companies and who has required the close attention of the California State Corporation Department on numerous occasions. This atrocious advertisement deals with certain lead prospects in the Death Valley region of California. It alleges that the prospect "looks for all the world to me (C. C. Julian) like a hundred million dollar silver-lead mine and might be twice or three times that big."

The claims are nothing but prospects, and are undeveloped. Mr. Julian's opinion is not backed up by any experience. Mr. Julian states that he has had eight of the foremost engineers and geologists of America examine and make reports on the prospects. The "engineers" named in the advertisement are Charles D. Wilkinson, Henry M. Crowther, J. W. Bandhauer, Ira Judson Coe, and Dr. Bruce L. Clark. Mr. Charles D. Wilkinson has been interested in Nevada gold and silver properties of minor importance. He is not one of the foremost engineers of America. Mr. Henry M. Crowther is not named in any of the engineering directories, nor is J. W. Bandhauer. None of these men are members of the Institute, nor have their names appeared in Who's Who in Engineering. Mr. Coe is a practicing civil engineer and is a member of the Institute, but does not appear to have any special connection with mining. Dr. Clark is professor of paleontology and director of the Museum of Paleon-

tology of the University of California. His opinion on a mining claim would be of doubtful value. To represent these men as foremost "engineers and geologists" is distinctly overstepping the bounds of good sense and tact, and no doubt all of them will resent Mr. Julian's statement.

Mr. Julian quotes Dr. Clark as stating in his report: "No one can estimate the quantity of ore in this block of limestone. The block is at least two thousand feet square and is over seven hundred feet high. Allowing the square area, but taking the thickness of height of only twenty-five feet and considering only one-fifth of the rock as lead-bearing, you would have a tonnage of nearly a million tons of milling ore." No mining engineer of repute would be guilty of making an estimate of this kind, although we do not know how closely a paleontologist would limit himself to statements of fact.

The prospects are in a desert region difficult of access and at considerable distance from the railroad. Operating costs will be excessive, although this fact is lightly tossed aside by Mr. Julian, who is of course interested in selling stock to the public. Criticism of the *Los Angeles Examiner* is invited by its accepting and publishing advertisements of the kind that we have before us. For a newspaper to allow a notorious promoter to assert that "our whole body of ore is above the grass roots" is sufficient to condemn both the promoter and the newspaper.

Two Presidents

JUST as the mining industries prepare to greet Samuel A. Taylor, coal operator, as president of the American Institute of Mining and Metallurgical Engineers for the ensuing year, they note with regret the passing of Col. Daniel B. Wentz, also a coal operator and past president of the National Coal Association, who was elected to the presidency of the American Mining Congress in Washington a scant two months ago. It is long since a coal man presided over the latter body. During this year, with the coal industry troubled as it has been, and with the public mind focused on the deadlock in the anthracite region, now fortunately broken, it seemed to be a fitting coincidence that representatives of that industry should head the two largest organizations of mining men in the country. It tended to strengthen the influence of these organizations in any efforts that they might make toward helping solve the problem of the day. On another page a sketch of the career of Mr. Taylor is given. The obituary of Colonel Wentz appeared in last week's issue.

Comparative Risks and Burdens of Mining

THE FIGURES produced by the National Industrial Conference Board of New York are always interesting and instructive. It is true that all statistics need to be regarded with greater caution and suspicion than plain prose statements of supposed fact, because they are just as likely to be wrong, but carry the semblance of authority and are hard to disprove. This is a general reflection and caution, and a statement of a well-known truth; and has no present and special application.

In a statistical analysis on "Cost of Government in the United States," the Board calculates that out of the $2,572,000,000 paid by incorporated business organizations in 1923 as federal, state, and local taxes, 5.1 per cent came from mining and quarrying companies—a small percentage, of course, as compared with 38.4 per cent paid by manufacturing companies, 24.3 per cent by transportation and public utility companies, or 16.2 per cent by banking and other financial corporations.

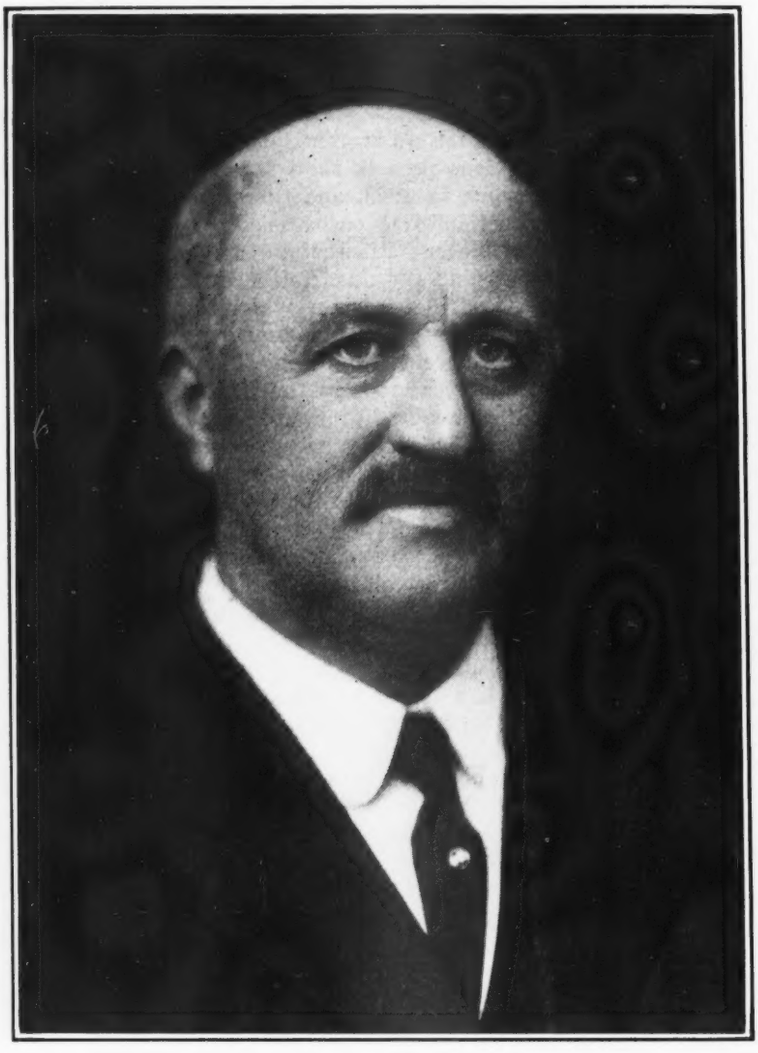
But when it comes to comparing the taxes paid with net income, the statistics for the mining and quarrying industries tell a different tale, for it appears that these corporations paid in total taxes 93.3 per cent of their net income in 1923, and therefore head the list; next come agricultural corporations, which paid 44.2 per cent, while manufacturing companies paid only 22.4 per cent, and the financial organizations paid 32.2 per cent of their net income—which shows the advantage of being a manufacturer or financier rather than a miner. But there are other fascinating figures. Out of the 398,933 corporations in the United States, 40 per cent showed, instead of profits, deficits aggregating $2,014,000,000. The largest membership in this "in-the-red" group are, to be sure, the mining and quarrying corporations, which represent 72 per cent of the total number of mining and quarrying corporations; next, of course, comes that other pioneer purveyor of basic raw material, the agricultural corporation, with 58 per cent "in the hole"; in the manufacturing industries 37 per cent failed to show a profit, while among the best showings is that of the banking, finance, and insurance group, with 35.3 per cent showing deficits for the year.

Without desiring to point the matter further, the National Industrial Conference Board figures show that mining corporations had the largest percentage (72) of net deficits in 1923; that those which kept on the right side of the ledger paid out nearly all their net income in taxes (93.3 per cent); while groups like the manufacturing and the financial corporations had a far less percentage of losing enterprises, and also paid a much smaller proportion of taxes to net income. This is perhaps worth noting, in contrast to some of the buoyant statements of mine promoters which are being circulated in the endeavor to separate the small investor from his money. It also makes plain why there is a certain steady desertion from mining to other industries.

These figures do not offset the fact that mining is a great, a basic, and rapidly growing industry, out of which great profits are now and will be made. They do emphasize the truth that in mining, more than in any other division of industry, the race is to the swift and the battle to the strong. The risks are greater, but to the winners the rewards are not less.

Iron Ore in the Dominion

ONCE AGAIN reports have gained circulation as to the discovery of great iron-ore deposits in Canada. So seriously was the latest canard taken that it is said to have found its way into the monthly bulletin of a certain trust company of Illinois. It is likely that the deposits of the Belcher Islands, in Hudson Bay, have furnished the basis of the rumor. They are neither new nor startling, although representing a large tonnage of low-grade hematite that, incidentally, is very difficult of access. These occurrences were described in *Engineering and Mining Journal* of Aug. 31, 1921. The day, no doubt, will come when they will merit commercial consideration, but that day is still remote. About eighteen months ago a silly story of huge iron-ore reserves in the Raccoon Mountains of Alabama gained currency in St. Louis. The recent report is less fantastic but still misleading.



New President of the A.I.M.E.

Samuel Alfred Taylor

THE LINEAGE of Samuel Alfred Taylor, the newly elected president of the American Institute of Mining and Metallurgical Engineers, dates back to the Revolutionary days, his grandfather Jacob Taylor having been a soldier in the cause of liberty. Mr. Taylor was born near Pittsburgh, Allegheny County, Pa., on Oct. 24, 1863. He was educated in the public schools, the Polytechnic Institute in Old Allegheny, and at the Western University of Pennsylvania, now the University of Pittsburgh, being graduated in the class of 1887 with the degree of civil engineer. He received the honorary degree of doctor of science from the University of Pittsburgh in 1919. In July, 1887, Mr. Taylor began work for the Carnegie Steel Co. at the Homestead plant, then under the management of Julian Kennedy, as draftsman in the structural steel department, where he remained about one year, when he resigned to accept the position of assistant engineer of construction of branch lines of the Pennsylvania Railroad, with headquarters in Greensburg, Pa., which position he held for five years. In 1893 he undertook consulting work as a civil and mining engineer, opening offices in Pittsburgh, where he has maintained them ever since. For many years he carried on the general practice of engineering, designing and building water works and sewer systems, street and road improvements, railroads and buildings, as well as designing and building a number of coal-mine and coke plants. For an extended period he was engineer for about ten municipalities in the western part of Pennsylvania, and acted in a similar capacity for several coal companies. About 1900, with associates he became interested in the development of coal properties and opened up a number of coal mines, and from that time up to the present he has devoted most of his time to coal mining and its allied industries, both as consulting engineer and in a managerial capacity. Mr. Taylor has served on several national commissions pertaining to mining matters, as well as on several state commissions of public interest. He has been one of the consulting engineers of the U. S. Bureau of Mines ever since the Bureau was established. During the World War he served as technical advisor to Harry A. Garfield, U. S. Fuel Administrator. In 1918, he assisted the Canadian Government in fuel matters, which were under the direction of C. A. McGrath, Fuel Administrator for the Dominion, and helped solve a number of troublesome problems in Nova Scotia and New Brunswick. He served with United States Coal Commission in 1919 to adjust the labor scale, and also on the board of engineers which made the valuation of coal lands and properties for the U. S. Coal Commission in 1922. Mr. Taylor was president of the Coal Mining Institute of America in 1911; of the American Mining Congress in 1913, and of the Engineers Society of Western Pennsylvania in 1914. He has been a member of the American Institute of Mining and Metallurgical Engineers since 1905. Mr. Taylor is one of the trustees of the University of Pittsburgh, and has always taken an active part in civic affairs. With his broad experience and pleasing personality, the Institute is indeed fortunate to have the advantage of his counsel and guidance during the ensuing year.

Mining Camps of North America

Kirkland Lake: Ontario's Second Gold District

By Edward H. Orser
Consulting Mining Engineer and Geologist, Swastika, Ont.

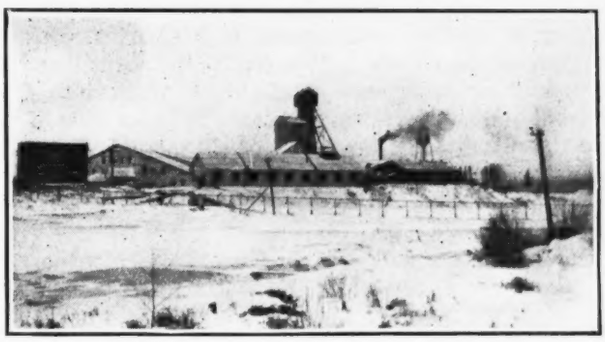
Edward H. Orser

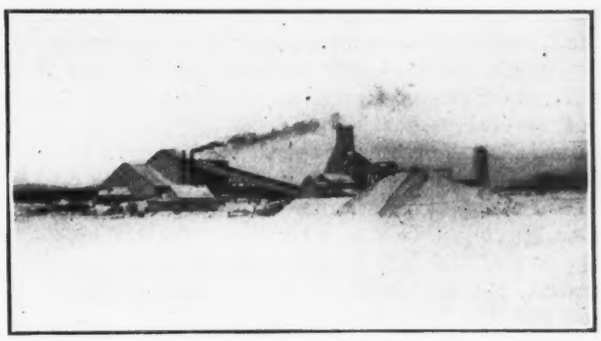
THE Kirkland Lake gold area, in Canada, is receiving the attention of those interested in the mining of the precious metals to a degree not evidenced heretofore; and this is as it should be in view of the splendid developments of the last few years. The purpose of this article is to give a general description of the whole field which may serve as an incentive to more intensive study by those who are interested in the finding and making of mines. Splendid reports on this district have been issued by the Ontario Department of Mines, and these should be obtained. The last revision of the report by A. G. Burrows and P. E. Hopkins, Vol. XXXII, Part IV, issued recently, sets forth the story of the development of the area from the time of its discovery in 1911 to the end of 1924.

Entry to the Kirkland Lake gold area is made at Swastika, Ontario. Swastika is 164 miles north from North Bay, the southern terminal of the Temiskaming & Northern Ontario Railway; 392 miles from Toronto, in Ontario. One has the choice of travel over the new line of the Nipissing Central Railway by electric car or by fast motor buses operated by a local transportation company over the good macadam highway which is part of the main trunk road system of the District of Temiskaming. Kirkland Lake lies five miles northeast of Swastika and is a thriving settlement around the southern and eastern end of the lake that gave the district its name. The town is growing rapidly, and the last census shows 2,400 living within the municipal boundaries. Hotels are available and good telephone and telegraph services are now established along the lines of transportation.

Before the construction of the present line the wagon road from the station of Dane, seven miles south of Swastika, was the only way of entry to the townships of Gauthier, McVittie, and McGarry. Now, with the new storage-battery passenger and express-car service over the Nipissing Central Railway, which runs to the Quebec border and follows the "sedimentary" belt throughout, the trip is a pleasant one.

First discoveries in the vicinity date back to 1906 at the time of the Larder Lake activities. At this time gold was discovered also at Swastika. The old Swastika mine was opened up, and, continuing work, produced good ore. Some staking took place, and work upon the adjoining claims owned by the Lucky Cross Mining Co. resulted in more gold discoveries in 1911. Renewed activity and more intensive prospecting brought to light the quartz veins cutting red feldspar porphyry at Kirkland Lake to the northeast, the first find being made by W. H. Wright on what is now the Wright-





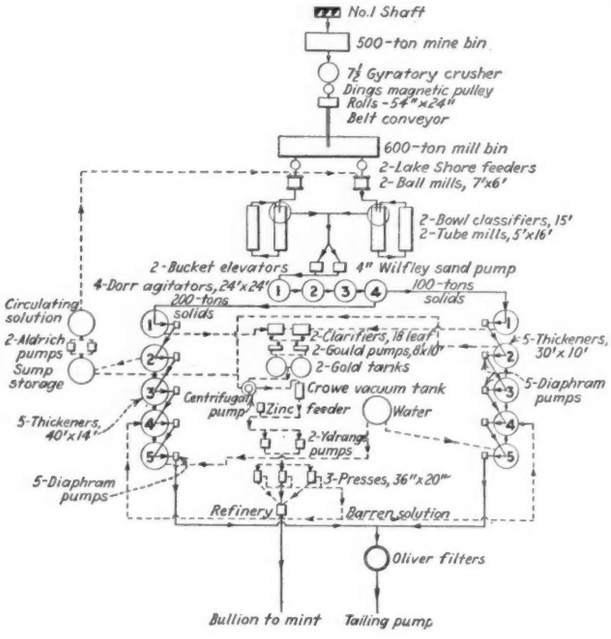
Above—Lake Shore mill headframe and shops. Below—New Shaft of the Teck-Hughes Company

Above—At the Wright-Hargreaves property. Below—Kirkland Lake Gold Mines, Ltd., where sinking is in progress

Plants of the four principal producers in the Kirkland Lake district

Hargreaves property. Harry Oakes, another prospector who staked claims in the same neighborhood, made a find on what is now the Tough-Oakes-Burnside and another on the claims that later became the Lake Shore. Both these men, starting with practically nothing of this world's goods, are now millionaires and large stockholders in the present producing organizations.

From 1911 the development of the camp has been



Flow sheet of Lake Shore mill

There are only minor differences in the methods of cyaniding in the plants of the district. This flow sheet accordingly is typical of all

rapid, though slowed up by the war and a labor strike in 1919. It was soon found that there was a common structure running through the center of the camp. Plants were erected to carry on more extensive operations; and, with the consummation in 1914 of arrangements to supply hydro-electric power from Charlton to the south, underground development was soon in full swing on several properties.

The first mill was erected at the Tough-Oakes in 1915, following which the Teck-Hughes, Kirkland Lake, and Lake Shore companies built similar plants, the latter beginning operation in the spring of 1919. Wright-Hargreaves was the last of the present producers to build a mill, but beginning in the spring of 1921 it has been running continuously to this date.

In 1922 the Ontario Kirkland amalgamated with the Montreal Kirkland group to form the Montreal Ontario, which name was later again changed to Kirkland Rand Gold Mines. A mill was erected, ran a short time and produced a small amount of ore, but was forced to shut down through shortage of developed ore underground. This mill was destroyed by fire recently, together with No. 2 shafthouse and the top plant.

Five Important Producers

Production to date has come from the immediate vicinity of Kirkland Lake, with a few exceptions only, and five properties have contributed to it—namely, Lake Shore, Wright-Hargreaves, Teck-Hughes, Tough-Oakes-Burnside, and Kirkland Lake mines. All are on the same series of ore structures extending two miles in length from the Kirkland Lake mine, at the west end of the camp, to the Tough-Oakes-Burnside, at the east on the boundary of the townships of Teck and Lebel. The old Swastika mine, the Lucky Cross, the Reddick, the Harris Maxwell, and the Ontario Kirkland are also contributors, but the total production of all these has not at this date equaled any one of the others above mentioned. Lake Shore and Wright-Hargreaves are paying dividends regularly, and it is expected that Teck-Hughes will be doing so soon. Tough-Oakes-Burnside, Kirkland Lake, and Sylvanite are doing extensive exploration and development and are paying small attention to milling, although the first named has turned its mill over of late and is again producing bullion, largely from the reworking of surface dumps. Rumor has it that a merger is pending between Wright-Hargreaves and Sylvanite, and if it matures it will be quite possible that the plant of the former will be enlarged sufficiently to handle the production of both groups. The Kirkland Lake Gold mill has been silent for some time and will likely remain so until the deep exploration now under way on the lower levels has clearly defined the position of this mine in regard to ore reserves.

Five other properties, Kirkland Rand, Hunton, Kirk Gold, Associated Goldfields, and Crown Reserve, have been engaged in underground exploration, but are not producing.

Ores in Temiskaming Sediments

No elaborate description of the detailed geological features will be attempted in this article; the reader is referred to the government reports. The prominent feature of the area is a belt of sediments—conglomerates, greywacke, quartzite, and slate—which has been classified as Temiskaming in age. This band starts about a mile east of Kenogami Lake and extends without interruption through the townships of Teck, Lebel, Gauthier, McVittie, and McGarry, a distance of more than 30 miles, ending abruptly on surface against an outcrop of another sedimentary rock of later age near the Quebec boundary. Apparently the same band of Temiskaming sediments continues through into Quebec, but the next outcrop met is on the east side of the later series in the township of Dasserat, whence it again extends on eastward into the Rouyn field. These sediments are highly inclined and dip, in general, to the south.

Outside of a small area in Teck Township the surrounding rocks are older Keewatin greenstones and consist of old lava flows, diabase, some rusty carbonate rocks, and iron formation. The exception noted above is a later intrusive syenite. Other intrusives, red and grey feldspar porphyries, quartz porphyry, and lamprophyre, are to be seen in dikes and outcrops of irregular outline. All rocks are cut by several later diabase dikes probably Keweenawan in age. Strong shearing is in evidence throughout the entire area in a general east and west direction. A considerable cover of glacial sand and gravel is met, but good exposures of all formations can be seen.

As to origin, there seems to exist a close relationship between the acid intrusive rocks and the deposition of ore. The intrusive rocks themselves are doubtless phases of an underlying granitic magma which was the original source of the ore solutions.

A table showing the accepted classification of the rocks of this area follows on page 319:

Pleistocene

Glacial and recent	Sand, gravel, clay, swamp

Pre-Cambrian

Keweenawan	Quartz diabase
	Olivine diabase
Algoman (Post-Temiskaming) intrusives	Red hornblende syenite
	Gray feldspar porphyry
	Felsite
	Red hornbelnde syenite
	Black mica lamprophyre
	Serpentine
	Hornblende and biotite granite and gneiss
	Granite porphyry
	Feldspar porphyry
	Felsite
	Hornblendite
Temiskaming	Conglomerate
	Greywacke
	Quartzite
	Slate
	Carbonate schist
	Rusty carbonate
Keewatin	Pillow lava
	Altered diabase
	Green schists
	Rusty carbonate
	Iron formation

The sedimentary rocks, that are classified as Temiskaming, after deposition and consolidation were subject to forces that folded them and tilted their beds into the present position. A period of violent igneous activity occurred later, during which the porphyries and associated intrusives were forced into the older formations. Shrinkage upon cooling of these rocks and the general readjustment produced fractures and prominent shear-zones in and through which the precious metals were deposited by circulating solutions. Considerable shearing and movement has also taken place later than this, with further deposition of vein matter and some dislocation of the original ore structures.

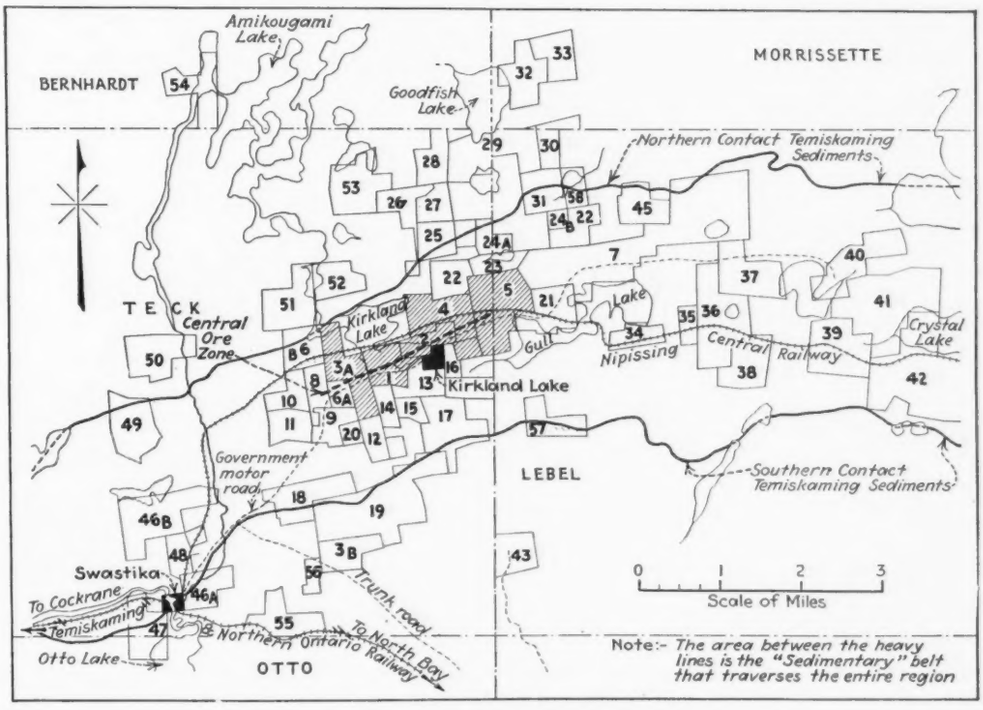
The sedimentary rocks in themselves have not been shown to be inherently of commercial value except in such areas as they are shattered and sheared and along lines of weakness such as contacts and bedding planes. Being structurally weak, they readily fractured, and during the period of igneous activity underwent considerable alteration around the intrusive contacts.

In the Kirkland Lake area proper there are several zones or belts upon which appreciable values have been found. The main ore zone cuts northeast and southwest through Kirkland Lake, and upon it are found the larger properties; Kirkland Lake Gold Mines, Teck-Hughes, Lake Shore, Wright-Hargreaves, Sylvanite, and Tough-Oakes-Burnside, in the order named, from the southwest. The Elliott Kirkland, United Kirkland, and Grozelle groups lie across the possible extension westward; and the Continental and Gull Lake properties cover it at the eastern end. Good ore has been found over its entire length of more than two miles between the Kirkland Lake mine and the Tough-Oakes-Burnside.

Several favorable prospects are situated adjacent to the producing group and include the Townsite, Hudson Bay, and Chaput Hughes properties, which lie immediately south of the main fault-zone. Another belt lies about two miles north and parallel, in the vicinity of Goodfish Lake. Labelle Kirkland, Goodfish, Providence, Fidelity, and Kirkland Central have established camps and have done considerable surface and some underground exploration. Geological conditions here are somewhat different, as all these properties lie north of the main sedimentary belt of rocks. The country rocks are Keewatin greenstones cut by quartz porphyries in the form of dikes and masses.

A shear-zone has been indicated and some work done upon it in the area adjacent to the north contact between the sediments and the Keewatin around O'Connell Lake. The Kirkland Federal, Sanderson Kirkland, East Kirk, Wright, and Wessel properties are situated on it.

South of the central shear zone about three-quarters



Property map of the Kirkland Lake gold area

Key to Map

No.	Property
1.	Lake Shore
2.	Wright-Hargreaves
3.	Teck-Hughes
4.	Sylvanite
5.	Tough-Oakes-Burnside
6.	Kirkland Lake Gold Mines
7.	Continental
8.	Elliott Kirkland
9.	Grozelle Kirkland
10.	Macassa
11.	United Kirkland
12.	Hunton
13.	Hudson Bay
14.	Minnaker
15.	Comfort
16.	Townsite
17.	Kirkland Rand
18.	Canadian Kirkland
19.	Highland Kirkland
20.	Honer
21.	Gull Lake Mines
22.	Kirkland Federal
23.	Wright
24.	Sanderson Kirkland
25.	Wessell
26.	Fisher
27.	Kitchener Kirkland
28.	Fidelity
29.	Labelle Kirkland
30.	Kirkland Central
31.	East Kirk
32.	Goodfish
33.	Providence
34.	Queen Lebel
35.	Kirk Gold
36.	King Kirkland
37.	Lebel Oro
38.	Pawnee
39.	Wood Kirkland
40.	Bidgood
41.	Moffatt Hall
42.	Lebel Crystal
43.	Dane Copper Mine
44.	Elstone Dunkin
45.	Lebel Lode
46.	Kirkland Gateway (Lucky Cross)
47.	Teck Otto (Swastika)
48.	Pittsburgh Corporation
49.	McIvor
50.	Penn Kirkland
51.	Columbus Kirkland
52.	North Shore Syndicate
53.	American Kirkland
54.	Bernhardt Gold Mines
55.	Teck McGinley
56.	Dominion Kirkland
57.	Harvey Kirkland
58.	Granby Kirkland

cut drawn first. Stope backs are taken down with horizontal holes in benches drilled from the top of the broken ore.

Both the timbered stope floor with chutes and the boxhole system with solid floor are used, but the latter plan is becoming more general practice with a view toward providing greater safety and also saving timber.

Pumping Problem Not Important

Drainage is provided by carrying proper grades on the levels to give a gravity flow toward the shafts, where pumps, both air and electric, relay the water to the surface. None of the underground workings are what might be called "wet," but a considerable volume of water is handled at all properties along the main shear zone. Many of the fault planes running through the ore are water channels. At most mines all traveling ways are electric lighted. Carbide hand lamps are used by the men. All the plants in the central zone have electrically driven, double-drum hoists. Outside plants, away from the transmission lines, still use steam.

The Lake Shore hoist was made to order by the Canadian Ingersoll-Rand Co. at Sherbrooke, Quebec. It weighs 75 tons and will handle 9 tons at a rope speed of 1,500 ft. per minute. The drums are independent, 8-ft. diameter and 6-ft. face, and mounted on a 13-in. shaft. It is driven by a 250-hp. motor running at 440 r.p.m. A Lilly Model D controller is used, and the brakes are operated by air. The cable used at present is 1⅛ in. diameter. Skips of three-ton capacity will be used for the time being. This equipment is sufficient to carry the work to 2,500 ft. depth, and was put into service on Oct. 31, 1925.

Teck-Hughes's hoist was made by the Nordberg company. It is of about the same capacity, but differs from the Lake Shore hoist in that it has a single drum 8 ft. in diameter and 12 ft. long, divided into two 6-ft. faces. It is driven by a 125-hp. motor. Cages are being used at this time, but a new skip hoist will be installed later and the present equipment used for men and supplies.

The larger plants whose operations preceded the availability of electric power still keep their steam plants in order to guard against a shutdown through breaks in the transmission line. Teck-Hughes has also put in a 300-hp. gas engine as extra precaution.

Electric Power Available

Since the Northern Ontario Light & Power Co. installed its line, in 1917, there has been a plentiful supply of power, and breakdowns have been confined to damage to the transmission line through storms and fire.

There are two structural steel headframes in the camp, at the Lake Shore and the Teck-Hughes. Both are more than 100 ft. high.

Cyanidation by "All-Sliming"

As with mining, there is little variation in the milling practice except for minor details. The work to date has been more in the nature of a careful experiment to determine the best method suited to the ore. In the newer plants, equipment and methods that had proved successful were adopted, in so far as it was possible, and weaknesses were eliminated. As developed to date the principal features are as follows:

1. Coarse crushing with either Blake, Farrell, Telsmith, or Buchanan crushers.
2. Coarse grinding with ball mills and rolls.
3. Fine grinding in solution in tube mills, coupled with rake classifiers in closed circuit.
4. Cyanidation with continuous agitation and thickening with counter-current decantation in Dorr tanks.
5. Precipitation with zinc dust using Crow vacuum tanks and the Merrill process in filter presses.
6. Refining in bullion furnaces.

Amalgamation was tried out during the early days of the camp by the old Tough-Oakes management, which erected a five-stamp mill to treat ore after the high-grade had been hand-picked from it. The recovery was 55 per cent. Tailings were impounded and later cyanided in the mill built in 1915. The Lake Shore flow sheet is shown in the drawing on page 318.

All the mills of the camp have level sites, and all products are either pumped or elevated. Primary crushers are located near the shaft mouth. Inclined belt conveyors carry the crushed ore to the mill bins. At the Tough-Oakes-Burnside plant the mill is a quarter of a mile from the main shaft, and an aërial tramway has been erected to transfer the ore.

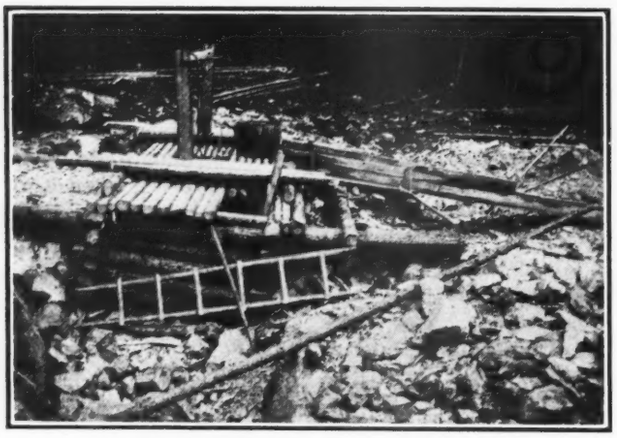
Teck-Hughes employs five-stage crushing and grinding: jaw crusher, gyratory, rolls, ball mill, and tube mill. Lake Shore has no jaw crusher, but delivers the product of the preliminary gyratory to the rolls. Wright-Hargreaves replaces the gyratory with another jaw crusher. All have ball and tube mills. The product of the tube mills is handled, in all cases but one, in a Dorr classifier in closed circuit. Lake Shore has two 15-ft. bowls, whereas the other mines have the older duplex machine. Teck-Hughes and Wright-Hargreaves have placed a cone in line immediately after the tube mill, the final product of which goes to the primary thickener. Overflow from the thickeners is clarified in leaf vacuum filters and passes to the precipitation tanks. The underflow is pumped through a series of thickeners and washed by counter-current decantation.

Countercurrent Decantation and Vacuum Filtration

Teck-Hughes and Wright-Hargreaves now have Oliver vacuum filters treating the discharge from the last tank before it passes to waste, and Lake Shore is excavating ground for the installation of the same kind of equipment. Zinc dust is used throughout for precipitation, making use of vacuum tanks and filter presses for the precipitate, which is treated to an acid bath to remove excess zinc, melted, and cast into bars about 850 fine, which are sold to the Royal Mint at Ottawa. An arrangement has just been made with the mint

Crystal Beach, near Kirkland Lake

At this resort, 7 miles away, gold mine operators find relaxation



The Kirkland Central prospect

From such beginning the big mines in the Kirkland Lake area have come

of a mile, along and adjacent to the south contact of the sediments, is a much disturbed area with many heavy fractures and considerable faulting. The Harvey Kirkland, Kirkland Rand, Highland Kirkland, Comfort, Hunton, Honer and Canadian Kirkland lie here, in the order named, from east to west. All have operated intermittently and are good prospects.

These ore deposits are regarded as having been formed by the infiltration of precious-metal-bearing solutions throughout strong shear zones which cut through all rocks in the central area. The minerals characteristic of high temperature deposits are absent, but it is probable that deposition took place at considerable depths. Shattered ground through these shear zones has been recemented by quartz solutions carrying free gold and tellurides, iron, copper, zinc, lead, and molybdenum sulphides, with some replacement of the wall rocks. All gradations of ore may be seen, from a quartz and carbonate vein filling, with little or no rock, to wall rock with little or no quartz or calcite.

Wide Variety of Vein Minerals

The following vein minerals have been identified: native gold and silver, altaite, calaverite, kalgoolite, coloradoite, petzite, tetradymite, hessite melonite, pyrite, chalcopyrite, galena, zinc blende, molybdenite, graphite, quartz, calcite, and barite, with some alteration products such as chlorite and sericite.

Two well-defined fault planes form part of the main shear zone and serve as fairly definite walls for the orebody. The interval between them varies up to 40 ft., but the average would be about 10 ft. In general, ore is confined between these two planes, but some mineralization of the ground outside is occasionally met. Strike faulting later than the ore deposition, with attendant brecciation and deposition of secondary vein matter, has been observed. Fault gouge and slickensides are common. Underground development has shown the presence of some faulting across the ore structure, but the displacement has not been of such extent as seriously to hamper operations in the central area.

Oreshoots in the central area vary greatly in width and length. The longest intersection so far encountered is on the 600 level of the Lake Shore, where the drift is in ore from the shaft to the west boundary of the property, a distance of about 1,500 ft. This is exceptional, and the average horizontal intersection appears to be about 300 ft. Information as regards vertical length is rather scant, but it is known that the large Lake Shore shoot extends from above the 200 level to below the 1,000 level, which is the present bottom. Another shoot at the Kirkland Lake mine is more than 800 ft. in vertical length.

The general tendency of oreshoots west of the Lake Shore is to rake westward at a fairly steep angle. With this fact in mind, J. B. Tyrell, manager of the Kirkland Lake mine, planned the present development, which has come apparently to a favorable termination, in that it is believed that he has picked up the extension of the rich Teck-Hughes oreshoots on the present 1,975 level. Examination of longitudinal sections along the orebodies shows that individual shoots in nearly all cases have lengths vertically at least twice their horizontal intersections.

Mining Methods Are Standard

Underground operations are in general similar at all Kirkland Lake properties. Entry is made by shafts, and in the central area all are vertical with the exception of the Tough-Oakes and Burnside. There are several two- and three-compartment shafts; the new Teck-Hughes main shaft has four compartments. All are well timbered throughout with square sets. Owing to extensive lumbering operations over the area in the past, little suitable timber is available, and except for lagging and minor supports material must be brought in. Considerable British Columbia timber is bought.

During the earlier stages of the work the level interval at all mines was 100 ft., but of late this has been changed to 125 ft.

Sinking usually has been started on the outcrop, and, as the main shear dips about 85 deg. to the south, crosscuts are needed from the shafts. Drifts are run in the ore generally at all levels, with backstoping the width of the shear zone. Chutes or boxholes on the drift are used to load shrinkage from the stopes into cars, which are trammed to the shaft and hoisted in a cage to the surface. The Lake Shore will install a crusher station on the 800 level, drop the broken ore from the upper levels through passes to an ore pocket, crush, and elevate with skips. Teck-Hughes also has planned to use skips later, and the other operators will possibly follow this practice.

Hand tramming is in vogue except at the Wright-Hargreaves property. Here a portable electric locomotive is used and moved about from level to level as needed. This is a great improvement. End-dump one-man cars are used generally.

Drilling equipment is standard Sullivan, Ingersoll-Rand and Waugh one-man air machines, mounted on columns, for lateral work and stoping; heavy sinkers are used in the shafts. All mines have machine sharpeners making the ordinary four-wing crossbit, and water tempering is common practice. The Lake Shore uses lug steel. Steel is handled in small trucks to the shaft mouth, loaded into cages, dropped to the levels, and sorted into racks for the convenience of the drillmen.

Forcite, 40 and 50 per cent strengths, is the usual explosive; it works well in this ground. The porphyry and allied rocks in which the greater amount of work is done are fairly hard on steel but shatter well with explosive. Drift and crosscut faces are driven with the usual 12- to 20-hole rounds, with the center

townsite, and thence it is distributed by gravity flow to the consumers. Septic tanks have been installed to handle municipal sewage and general sanitary arrangements are rapidly becoming satisfactory.

A new general hospital has been built at the townsite at Kirkland Lake and is now equipped. The individual mines had previously provided efficient first-aid departments of their own to look after accidents, but heretofore the miners' dependents were under the necessity of going out of town for surgical treatment.

Production

The accompanying table gives the production of the five leading producers to Sept. 30, 1925.

Production

Mine	Tons Milled	Gold	Silver	Total Gold and Silver	Total Recovery per Ton
Lake Shore.....	252,410	$5,307,110	$14,046	$5,321,156	$21.08
Wiight-Hargreaves	373,722	4,480,988	16,319	4,497,307	12.03
Teck-Hughes.....	271,375	4,315,974	14,344	4,330,318	15.96
Kirkland Lake....	187,131	1,074,222	5,369	1,079,591	5.77
Tough-Oakes-B...	184,088	2,270,651	29,596	2,300,247	12.50
Total to Sept. 30, 1925.....	1,268,726	$17,448,945	$79,674	$17,528,619	$13.82

Dividends

Mine	Issued Capital	Payment to Sept. 30, 1925	Per Cent of Capital
Lake Shore.....	$2,000,000	$1,420,000	71
Wright-Hargreaves.....	2,750,000	1,443,750	52.5
Tough-Oakes-Burnside.....	2,657,500	398,625	15
Totals.....	$7,407,500	$3,262,375	44

Outlook Seems Good

The future of the camp looks bright indeed, and as work progresses on the different properties the evidence multiplies as to the importance of the deposits. Those troublesome questions as to the possible depth to which an ore deposit will go and how long a life a mine will have are to be met here as elsewhere; but it is my opinion that in the case of these deposits at Kirkland Lake there are too many unknown quantities to make it possible to answer the question as yet. Conditions have been improving since work was started, and the present working horizon in all mines is as rich as, if not richer than, any in the past.

Electrolytic Method for Determining Zinc

R. E. Sullivan and H. S. Lukens recently described an electrolytic method for the determination of zinc in zinc ores, in *Chemical News* (1925, 131, 321-325). According to an abstract published in *Chemistry and Industry*, the ore is dissolved in dilute nitric acid and the solution is treated with an excess of potassium hydroxide. The precipitate is collected in a Gooch crucible, washed with hot water, dissolved in hydrochloric acid, and re-precipitated with ammonia. The combined filtrates are diluted to 350 cc. and treated with a further quantity of potassium hydroxide to make 20 g. in all after which the solution is heated to 60 deg. and electrolyzed with 8 amp. at 5 to 6 volts, using a platinum anode and a revolving nickel crucible having an immersed area of about 30 sq.cm. as cathode. Complete deposition is effected in about 45 minutes. Without stopping the current the spent electrolyte is siphoned off while a stream of distilled water is allowed to flow into the vessel to maintain the level of the liquid constant. When current ceases to flow, the cathode is removed, washed first in alcohol, then in ether, dried, and weighed.

Re-establishment of Gold Standard in Europe Making Slow Headway

In the first installment of a continued article on "The Gold Standard in Theory and Practice," the London *Statist* of Jan. 9 says that "it would be perhaps premature to judge the ultimate fate of a system that has been in operation for only eight months, but it is undeniable that the gold standard, as reintroduced in the British Empire and a number of Continental nations, at the end of last April, is today in a position of unstable equilibrium. Since April last the price levels of the gold-standard countries have fluctuated at least as violently as they did in the few preceding years; the comparative stability that characterized gold prices in pre-war days has notoriously failed to manifest itself. In Great Britain the return to gold —whether a cause or a coincidence—has been attended by acute depression in trade. Moreover, the step taken last April has ever since been a source of nervousness and hesitation in the money market, a condition that contrasts markedly with the freedom and confidence of past years, when a movement of a point in the dollar rate, a hardening of money rates in New York, or a change of a few points in the Bank of England's reserve ratio had not the predominating importance that they have today.

"There are three main reasons why the gold standard of today cannot be expected, for a number of years to come, to work as smoothly as it did in the pre-war period. The first lies in the phenomenal movements of gold during the war and post-war years. The second lies in the violent changes in the value of gold (that is, in terms of commodities) since before the war. The third is the enormous growth in the national debts of the late belligerent countries, especially of the European Allies, and the establishment of new inter-governmental debts on a scale unknown in previous history. Return to the gold standard in face of these conditions was, to a large extent, a leap in the dark. The nations had only a very short period of preparation for so momentous a step. They took no leisure to consider whether the world's monetary stocks of gold were properly distributed after eleven years of movements from country to country on an unparalleled scale, whether gold had already found its natural level after so long a period of violent fluctuations, or whether it was wise suddenly to convert huge paper debts into gold debts. Any serious study of the gold standard of today must consider these three essential factors."

Electrolysis of Zinc Sulphate

Corrosion of lead anodes used in the electrolysis of zinc sulphate solutions is caused by peeling off of the lead peroxide, and by the presence of chlorides. *(Chem. Zenter.*, 1925, II, 1,784, abstracted in *Chemistry and Industry.)* The lead consumption can be reduced to about 0.5 per cent of the weight of zinc obtained, by using solutions free from chlorides, by constructing the anode of pure material, and by protecting the apparatus from knocks and the solution from the possibility of unnecessary agitation.

The anode is subjected to a preliminary electrolytic treatment for several days in a dilute sulphuric acid bath, using a current density of 20 to 50 amp. per square meter.

whereby the producer will receive payment for his gold in Canadian funds at par, which will constitute a notable saving.

Tailings after passing through the filters are run to waste in open launders elevated on trestles. This has been a convenient method for filling up irregularities in the surface and making ground for building operations. Lake Shore has tried wooden stave pipe for the same purpose, and it appears to be giving good satisfaction.

Buildings at the camp are of heavy-timber construction, sheeted, and covered outside with asbestos paper. At one plant at least hair felt has been used between the paper and sheeting, resulting in a very comfortable temperature inside during the cold weather. All mills are well lighted by plenty of windows and high power incandescents for night operations.

Present Status of Properties

All properties in the central zone have ore down to 1,000 ft. in depth and, in the case of Teck-Hughes, Lake Shore, and Wright-Hargreaves, over a great proportion of the vein length on the properties. The greatest depth at which ore has been opened up is at 1,975 ft., at the Kirkland Lake mine. Teck-Hughes, immediately east, has indicated ore by diamond drilling to a point above the fifteenth level. The Lake Shore is confining operations to its bottom level at 1,000 ft. and the ground above it, for the present, but will explore below this horizon. No total ore reserves have been calculated here, but a conservative estimate would place them at $25,000,000 above the present bottom level. Harry Oakes, the president, states that there is no need to worry for six years at the present rate of production. The mill is operating at 300 tons daily, but can handle 500 tons without serious inconvenience. The management is busy at this time breaking in the new hoisting equipment and with the installation of the new crusher station on the 800 level. R. Knapp is the resident manager, and Mr. Oakes makes his home upon the property.

Wright-Hargreaves has operations to 1,250 ft., and is developing several strong structures. Ore reserves are rapidly increasing, and as the mill, which is handling about 400 tons per day, is capable of expansion to 500 tons when needed without much alteration, the production of this property will doubtless be increased. James Grant is the manager.

Will Increase Capacity of Teck-Hughes Mill

Teck-Hughes has opened up a mineralized zone upon its 1,300 level, which will probably make ore 60 ft. wide. This is the widest intersection in the camp to date. Work has been going on steadily at this property, opening up new ground upon the lower levels. Reserves have been increasing rapidly, and the first dividend has been declared. In the mill two sets of rolls, new agitators and thickeners, and two new filters will soon increase the capacity to 300 tons per day. D. L. H. Forbes is general superintendent.

Kirkland Lake Gold is working on the lowest horizon in the camp, 1,975 ft. A strong vein has been cut by a crosscut from the main shaft on this level and has been drifted on for over 200 ft. This is all ore, and it is expected that it will continue to the Teck-Hughes line. An option was taken during the last year upon the Chaput-Hughes property, to the south, to take care of possible extension of the vein system. A crosscut on the 1,600 level will soon enter this southern area, and it is part of the agreement that considerable exploration will be done on it. J. B. Tyrell is managing director and William Sixt resident superintendent.

Upon the Tough-Oakes-Burnside operations have been directed toward the prospecting of a rather complex series of oreshoots. Considerable dislocation due to faulting has given a lot of trouble, but the present management has been having encouraging results. The mill has been put into service again this year and is producing bullion. A. Stuart is manager.

The Sylvanite management has been busy exploring the lower levels of the property and has done considerable diamond drilling, with encouraging results. Rumors are persistent that a merger of this group with its neighbor the Wright-Hargreaves is planned, but no definite information is available. C. E. Rogers is in charge on the property.

The Kirkland Rand has been working underground steadily, and the latest reports state that encouraging results are being obtained on the 550 level. A disastrous fire on Nov. 22, 1925, destroyed the No. 2 shafthouse and the new mill. The officials say that this will be rebuilt next year. W. Osborne is manager.

The Kirk Gold Mines, in Lebel Township, two miles east of the Tough-Oakes property, now has a shaft down 300 ft., and considerable lateral work has been done on this level to prove up several well-mineralized veins. H. Donaldson is manager.

Continental Mines plans to resume work underground in a short time. It is hoped to develop the extension of the main ore zone eastward. T. Hussey is manager.

The Hunton, lying south of the Lake Shore, has resumed work again under the management of J. McPhee.

In McVittie Township, the Associated Goldfields and the Crown Reserve have been working to establish reserves warranting mill construction. The Goldfields have laid the foundation for a 500-ton cyanide plant near Pancake Lake. Crown Reserve has a considerable tonnage of low-grade ore blocked out above its 550 level and is engaged at this time in seeking extensions below. N. J. Evered is manager of the Crown Reserve.

Open-Shop Basis of Employment

General labor conditions in the camp are good, and there has been no trouble in securing the men needed. Since the strike in 1919, which lasted from June until October, there has been no labor trouble of any sort. The radical element at that time erected a hall at Kirkland Lake and attempted to upset the camp, but the resolute stand taken by the managers of the operating plants brought peace after eight months of agitation. All plants work on an open-shop basis.

Living conditions are good. Many mines have built a number of houses for their own married employees at the mines, and clean comfortable quarters are provided for the single men.

The Lake Shore lately has built a large fireproof tile building which combines a dormitory, dining room, and cookery under one roof. Each section is separated by a fireproof wall. This building is splendidly equipped with all conveniences and some luxuries.

Pure drinking water is had from Gull Lake, in Lebel Township, which has been set aside as a water reserve by the Provincial Board of Health. A municipal pumping plant, electrically driven, elevates the water to a 40,000-gal. steel tank set up on a tower over the

"Caduca"

How Old Mining Claims Are Forfeited and Relocated in Mexico

By H. H. Taft
El Paso, Tex.

IN THE OLD MONARCHIES the mines belonged to the crown and the operators paid a royalty to the throne. This theory has been handed down, and now only in the United States and Brazil does the surface ownership carry with it the metal beneath.

In Mexico no permanent title is given. Mining rights depend upon the payment of a tax—which, incidentally, is light—but this temporary title lapses upon default of payment. The word *caduca* is the nominative form of the verb *caducar*, meaning to void or lapse; hence when a title is declared *caduca* or *caduco*, as the case may be, the old title no longer exists and the property is open to relocation the same as if it had not been claimed at all. No mortgage or obligation of any sort can bear against it. No assessment work is required, but a clause in the Mexican Constitution of 1917 compels owners to operate their mines. The annual tax is about $2 per acre per year. This can be paid annually or in periods of four months. To discourage speculation the tax per unit increases with the size of the claim.

If the tax be not paid within a period of four months, a fine is imposed which increases for each subsequent four-month period. No definite time is set, but when the Mexican Treasury Department is satisfied that no taxes will be paid, the title is declared canceled and the Department of Industry is notified. A further investigation is carried out by this department, and then the order is sent to the proper mining agency to publish the *caducidad*. This is done for thirty working days, after which the ground becomes open to relocation. Should there be several applicants, a raffle is held. The new title has its inception from the date and hour stamped upon it by the mining agent or his representative. Application is a written description in duplicate of the boundaries of the desired property and is accompanied by a receipt for the payment of the first year's taxes. Surveying must be done in sixty days and the monumenting in thirty days more.

A great many mine filings (denouncements) have been made in Mexico for purely speculative purposes; ground having favorable geological conditions, or lying in the neighborhood of known mines, or containing the continuation of known veins, is located. During the long revolutionary period just passed, the natives were greatly impoverished and foreigners discouraged. In some instances small mines were financially overburdened with capital stock, mortgages, high costs, high salaries and other charges. At the end of the revolution about 15,000 mining claims were delinquent in their taxes. Favorable offers were made and plenty of time was given to those who were willing to pay. Recently, these *caducidades* have been declared as fast as the clerical force of the department will permit. A person wishing to relocate any of these mines can request the department to give a specific property precedence, and action will ordinarily be taken promptly in compliance with such request.

Some mines of note in Mexico, with extensive equipment, are becoming relocatable. The English are abandoning mines that they have not been able to work profitably and that require considerable money with which to conduct operations having for their object unwatering, cleaning out, and re-equipping the properties.

American holdings that were overcapitalized and otherwise burdened are being dropped with the explanation that the country is unsafe and that investments are insecure. This sounds better in financial circles. Mines that are financed and managed by those who are unfamiliar with mining are generally failures and have to go *caduca*.

These *caducidades* are now coming out at the rate of about thirty per day. They are first published as the titles are canceled by the Treasury Department (Hacienda) in the Diario Oficial of the City of Mexico, which carries all legal notices, including the promulgation of all new laws and decrees. The matter then goes to the Department of Industry, Commerce and Labor, and the mining agency having jurisdiction advertises it by posting with other legal notices for thirty days. Up to the time a relocation is filed recovery can be made by paying the taxes and fines. After such relocation is received there is no redress, and the new tile, which comes after due process of surveying, is as clean as if no other claimant had ever held the property.

Metal Recovery at Broken Hill

Metallurgy at Broken Hill, New South Wales, has reached a high standard, according to a recent statement by G. C. Klug, of Messers. Bewick, Moreing & Co., and H. W. Gepp, of the Electrolytic Zinc Co., who have made visits to the principal mining centers of the world, and who report that Australian metallurgy is well abreast of the times, and that results obtained here compare favorably with those of other countries, according to *The Australasian* for Dec. 5, 1925. In this respect the figures relating to treatment results at the principal Broken Hill mines are of interest. The North Broken Hill, the Broken Hill South, and the Zinc Corporation mines now treat the crude ore for the extraction of both the lead and the zinc in the form of concentrates. The lead concentrates are smelted at the Broken Hill Associated Smelters at Port Pirie, South Australia, which is a proprietary company owned by the principal Barrier mining companies, and the zinc concentrates are either sold to Great Britain under the Board of Trade contract, or are treated at the Electrolytic Zinc Co.'s works at Risdon, Tasmania, after being roasted at various points on the mainland of Australia, and in Tasmania, where the sulphur fumes are used in the manufacture of sulphuric acid. In milling the crude ore it is desirable to leave as little zinc in the lead concentrate as possible, as such zinc is lost, whereas in the zinc concentrates the lead and silver content is sold at a considerable discount. The mill recently installed by the Zinc Corporation is doing particularly good work. The data following are of interest, as showing the percentage recovery from the ore:

Product	Broken Hill North			Broken Hill South			Zinc Corporation		
	Pb	Zn	Ag	Pb	Zn	Ag	Pb	Zn	Ag
Lead concentrate..	84	12	69	87	9.5	78	91	15	82
Zinc concentrate..	8	70	16	7	75.5	13	4	72	8
Residue (loss).....	8	18	15	6	15	9	5	13	10

Magnetometric Surveying as an Aid in Exploring Placer Ground

Comparison of Results with Those Obtained by Drilling and Actual Mining Leads to Conclusion That Areas of Relative Concentration Can Be Determined —Not a Means of "Finding Gold"

By King C. Laylander
Manager, Kitchener Hydraulic Mine, Keithley Creek, British Columbia

IN 1912 I became acquainted with Mr. Arthur Gibson, who had just returned from Nome, and who was enthusiastic about the possibilities of the application of magnetometric work to placer mining. It must be admitted that although I was interested, I was also skeptical. However, at the time I was conducting placer operations in the Cariboo district of British Columbia, and, while engaged in active work there, I read Mr. Gibson's article that appeared in the *Mining and Scientific Press*, I believe, in July, 1922. The usefulness of the information which could thus be gained to the work that I was doing was so great that I felt compelled at least to investigate. Accordingly, I wrote and obtained a copy of the book entitled "On the Location and Examination of Magnetic Orebodies by Magnetometric Surveying," by Eugene Haanel, of the Canadian Mines Department at Ottawa; also the pamphlet on the magnetometer, published in English by Fr. J. Berg, of Stockholm, Sweden. As a direct result I purchased the combined magnetometer and proceeded to use it in connection with the placer operations near Keithley Creek, with results set forth in this article.

Fig. 1 is a general plat of the ground included in the company's leases Nos. 1460 and 1552. Operations were being carried on in No. 1 channel when I started the magnetometric survey. Base line No. 1 was run adjacent to the channel that was being worked; section lines were run at right angles to it every 100 ft., and hubs were set at 50-ft. intervals, at which points magnetometer readings were taken. Fig. 2 shows the magnetic profiles taken along these section lines. The shaded areas show the channel as indicated by the magnetometer, and the hatched lines the outline of the channel as actually opened up.

At the close of the season of 1924 came the crucial test of the magnetometric work. The channel, then known, on lease No. 1460 had been worked out, and a relocation of pipe line and plant was necessary for the continuance of operations. The character of the ground made prohibitively expensive any physical exploration by shaft or tunnel. Accordingly, a new base line, No. 2, was run, and a magnetometric survey was made, laying out the channel areas. A copy of this plan was given to the Mines Department and published in the report of the Minister of Mines for 1924, on page B 129.

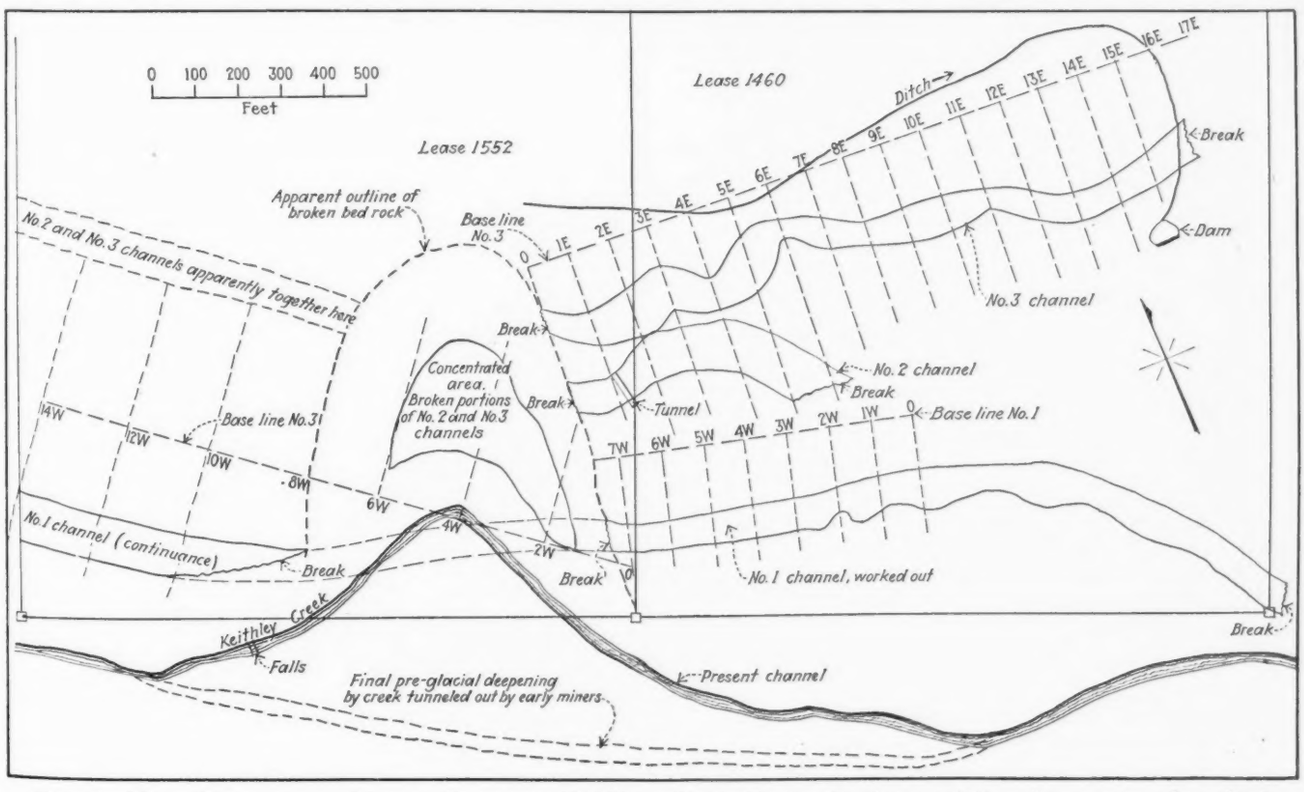


Fig. 1—Map of area covered by two leases at Keithley Creek, B. C., showing position of present and ancient channels and how magnetometric survey was made (November, 1925)

Looking downstream along Channel No. 1

Pipe lines, power house, and equipment were distributed with this data as a sole guide. The placer ground has been worked this year and conforms exactly to that indicated by the magnetometer. The area marked "concentrated area" in Fig. 1 was puzzling to explain until after being opened up, and it was the mining of this area which revealed the higher channels No. 2 and No. 3, or rather the broken ends (in section) of these two channels, which were outside the scope of the earlier magnetometric work, and indicated the advisability of covering a large extent of ground adjacent to placer areas thought to be worth exploitation. Fig. 3 shows the detail, plan, and elevation of this concentrated area, which consists of broken portions derived from the breaking down of channels No. 2 and No. 3, which resulted from the undercutting action of the modern creek.

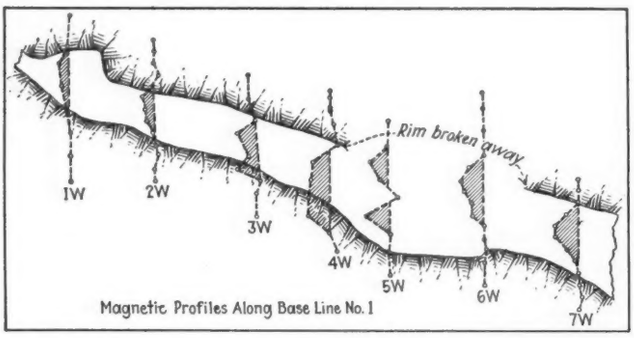


Fig. 2—Magnetic profiles taken along Base Line No. 1, plotted in Fig. 1

Shaded areas show the channel as indicated by the magnetometer (May, 1924). The outline of the channel is shown as actually opened up later.

Base line No. 3 was run in the general direction which the channel might take from the end sections shown by the opening up at the breaks. Cross-section lines were run at 100-ft. intervals, and stakes set at 50-ft. intervals along the section lines. The location in plan of the channels as indicated by the magnetometer is shown on Fig. 2. An adit has since been run into the hillside to crosscut channel No. 2 near section line 1*E* (Fig. 1), and proved as shown, the hill rim being struck at 86 ft. The channel bottom here was badly creviced, owing to settling of the concentrated area. Steps are now being taken to drill these two channels at 200-ft. intervals, as the overburden is only 40 to 60 ft. thick and the elevation of the channels is too high for hydraulic operations with the present water system.

Application of magnetometric surveying in other localities has been equally interesting and informative. Fig. 4 shows a placer area near Cedar Creek, in British Columbia, where rich placer ground was struck in 1922. This area is situated on a hill adjacent to Quesnel Lake, and I believe it to be a typical residual placer—residual in the sense that it is not a channel of erosion. This survey was made in the winter of 1923-24, since which time considerable work has been done in addition to that shown on the plat, and all the ground so far explored has confirmed the plat as accurate. However, little prospecting work has been done outside of the ground controlled by the Cedar Creek company, comprising the Steven's and Sheridan Leases shown on the plat. The ground is shallow wherever it has been opened up to date, varying in depth from 2 to 20 ft.

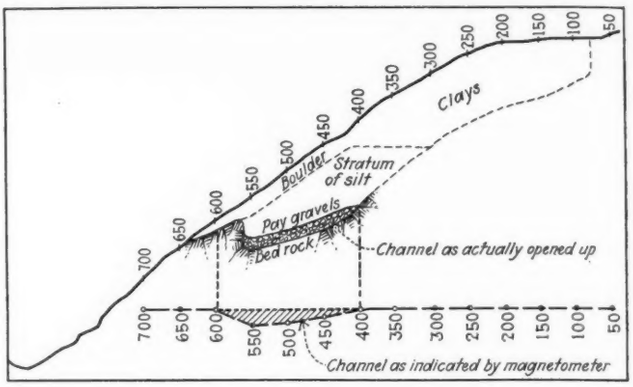
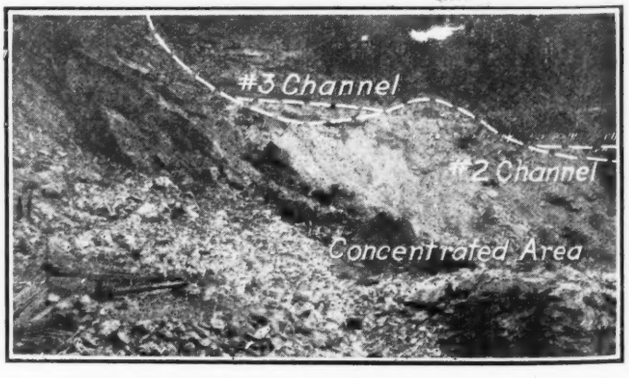


Fig. 2A—Cross-section 1W (see Fig. 2) showing surface profile and formation of ground, including the channel as actually opened up

The magnetic profile is also shown. The concentrates included pyrites, galena, and argentite, but no magnetite.

to bedrock, and it is hard to understand why systematic drilling has not yet been done. Seepage water makes difficult the testing of the ground by means of shafts. A considerable number of holes have been started and abandoned on account of the presence of this water.

Fig. 5 illustrates a [illegible] profile and ground section of three terraces [illegible] the Quesnel River, about 20 miles below Keithley Creek. Fig. 6 shows a lower terrace on the Quesnel River, in plan, where an attempt was made to demonstrate that a direct relation exists between magnetic intensities and values in cents per cubic yard. Shafts were sunk in areas of different magnetic intensities, and comparisons made, with the conclusion that within any reasonable distance, where conditions affecting concentration of placer values remain constant, there is a direct relation between magnetic intensities and values expressed in cents per cubic yard. In one instance where a shaft showed values



The "concentrated area" mapped in Fig. 1. The relative positions of channels No. 2 and No. 3 are indicated

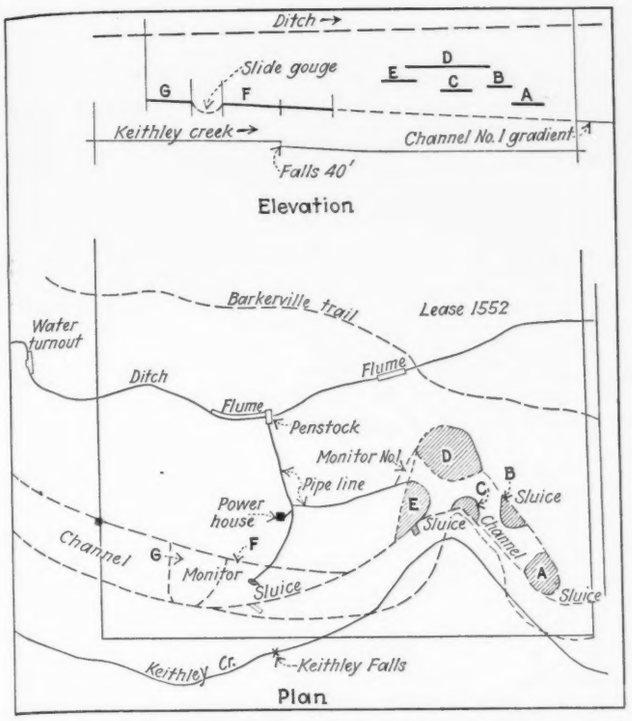


Fig. 3—Plan and elevation of "concentrated area" shown in Fig. 1

of 26c. per cubic yard, a distance of 2,600 ft. was run to a point where the same magnetic intensity was obtained. A shaft sunk at this point netted 24c. per cubic yard.

Fig. 7 shows a magnetometric survey compared with drilling on a property of the Metals Exploration Co. in California, the work being done in February, 1925. Drill holes were put on section lines as indicated on plats, and the holes were numbered as shown on the maps. Values in cents per cubic yard were platted in profile on the left of the section lines, and the magnetic intensities were platted in profile on the right of the section lines. No information of any sort was given by the company, and I was unfamiliar with the territory investigated. Black areas on the left of the section lines show the trends of "pay" as indicated by the drill, and the black areas on the right of the section lines the trends of pay as indicated by the magnetometer. Magnetometer readings were taken at 50-ft. intervals, and drill holes sunk at 150-ft. intervals.

The conclusion that I have reached as a result of the work thus far undertaken is that, if any selected area of ground be mapped magnetometrically, the resulting plat will show by magnetic intensities areas of relative concentration, in much the same manner as a contour map shows areas of relative elevation. Thus, one can select for prospecting or exploration either the best area, or what one may select as an average, to deter-

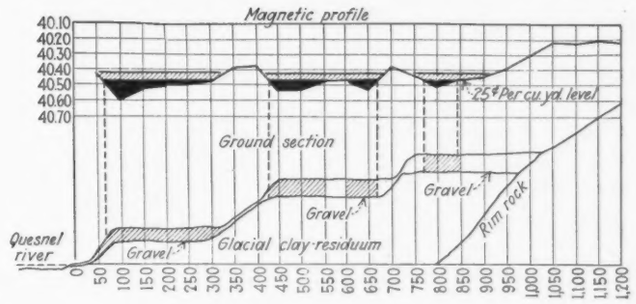


Fig. 5—Magnetic profile and ground section of three terraces on Quesnel River, Cariboo District, British Columbia

Terraced resorting of glacial residues. Concentrates were complex, mainly pyrites and magnetite.

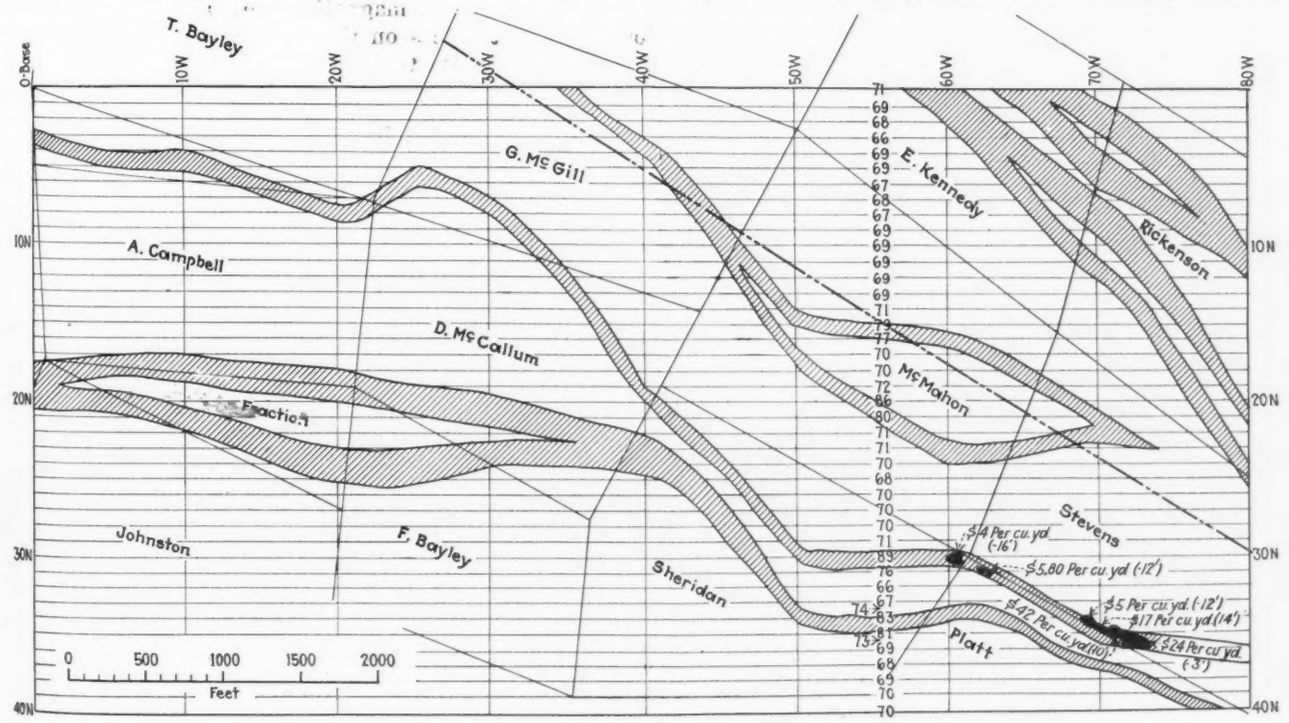


Fig. 4—Magnetic survey made at Cedar Creek, B. C., during winter of 1923-24, showing in plan the runs of residual concentration

All work done since in exploring this ground has confirmed the survey's accuracy, the author states. Concentrate consisted of metamorphosed pyrites, and iron-oxide stained quartz, but no magnetite. Area covered is 4,000 by 8,000 ft. in extent.

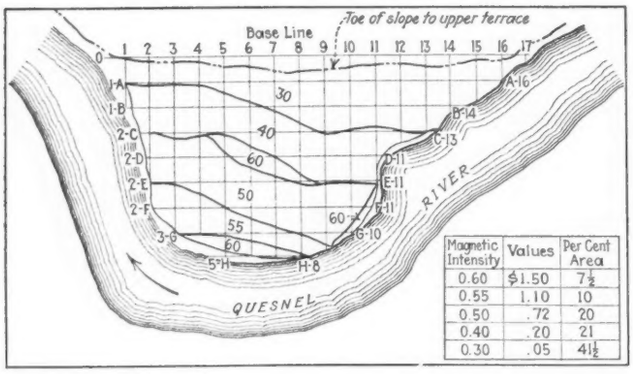

Base Line
Toe of slope to upper terrace
QUESNEL
RIVER
Magnetic Intensity | Values | Per Cent Area
0.60 | $1.50 | 7½
0.55 | 1.10 | 10
0.50 | .72 | 20
0.40 | .20 | 21
0.30 | .05 | 41½

Fig. 6—Map of a lower terrace on Quesnel River in plan
Here an attempt was made to show a relation between magnetic intensity and values.

mine the metal content, or mineral content. In the case of abandoned channel courses, hidden by overburden, one can readily lay out the trend of the buried channel and thereby minimize the amount expended on prospecting for and testing the deposit.

Instrument Is Not a Gold Finder

In no sense of the word, however, can the magnetometer be classed as a "gold finder." Placer gold is closely associated with other minerals, from the time it is eroded from rock in place until it is deposited along water-courses. These other metallic minerals, by virtue of their specific gravity, retain their association with the gold during the process of concentration. Many of these associated minerals are magnetic either directly or by induction. Certain other of the metallic minerals cause weak galvanic currents while being acted on by acid ground waters. These associated minerals cause disturbances in what may be termed the normal magnetic field, the maximum disturbance being generally vertically over the mineral. I have used the Thomson-Thalen instrument throughout my work.

I make no claim to be an authority on the subject discussed. Having found the use of the magnetometer a great aid in the exploration and development of placer ground, I have given the results obtained, all of which can be verified. However, the actual field work and determinations are not as simple as they appear, and anyone undertaking such work should not be surprised if he finds it less easy than reading the time of day. Intelligent study, however, should in the course of a few years develop the use of the magnetometer as a first step in any placer investigation.

New Cave Found in Copper Queen

Lessors working in the southwest division of the Copper Queen mine of the Phelps Dodge Corporation at Bisbee, Ariz., recently broke into a limestone cave, 220 ft. long, 80 ft. wide, and with an average height of 40 ft. Its outline is irregular and its height variable, being highest in the center. In describing this cave, Carl Trischka, chief geologist for the company, says:

"There are many interesting groupings of stalactites and stalagmites in the cave, and many delicate and beautiful crystals of calcite on the sides and floor. The variety of shapes due to various habits of growth of the calcite under the conditions of formation, is both great and delightful.

"The bottom has the appearance of a frozen stream. Its surface is level and as smooth as ice, but it is calcite, and the illusion of a frozen stream or glacier is heightened by the cascade effect in which the flat surface terminates.

"Up in one corner of the cave there is a shallow pool of water, which is surrounded on three sides by columns of stalactites and stalagmites which have grown together, forming a curtain-like effect. These columns have growing on them delicate crystals which are intergrown and others that are branchlike. The coloring is white to cream, and the columns, when struck, give forth a bell-like sound. This is called 'The Bath.'

"Standing almost in the center of the cave, there is a 14-ft. stalagmite, which is 5 ft. across at its base, and its top and sides are covered with ripple marks and small ridges which form irregular traces and patterns. A very fantastic Chinese pagoda effect is created by the calcite, which has formed on an inclined shelf of rock."

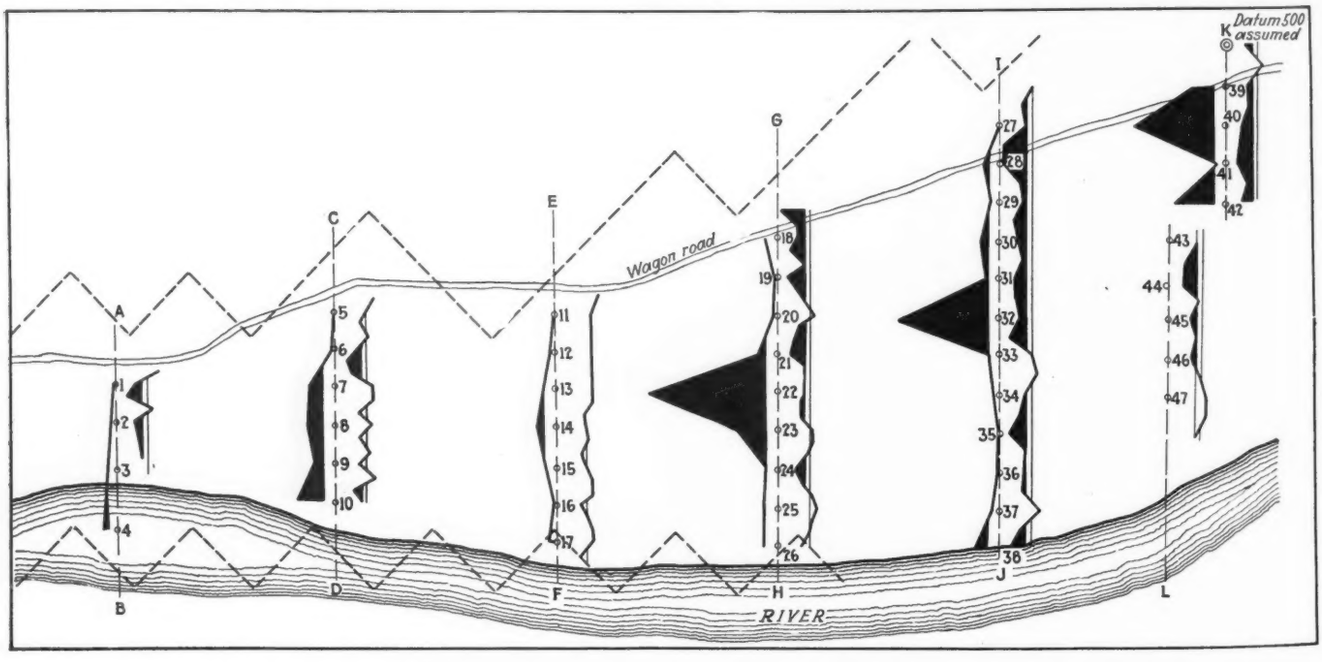


Fig. 7—Comparison of a magnetometric survey with results of drilling done on property of Metals Exploration Co. in California in 1925

Useful Operating Ideas

Ring Method of Shaft Concreting

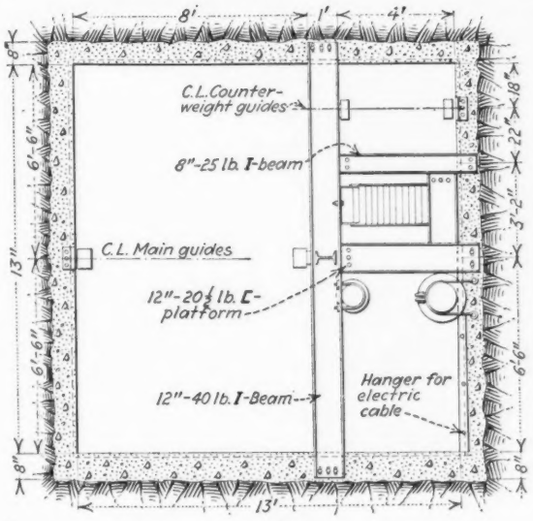
By W. V. De Camp

If the life of a mine will justify permanent construction, concrete shafts become a possibility, their application and design depending on existing ground conditions, fire hazard, and cost of maintenance. The specific method of concreting may vary with conditions, and, although solid concrete walls and dividers have come into quite general use, it may be possible in some cases to reduce costs by modified or combination methods.

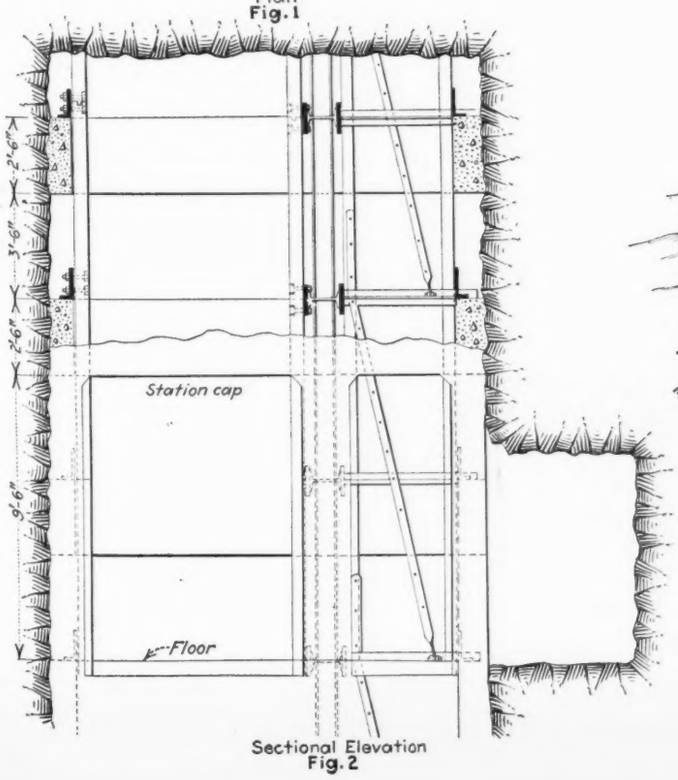
Shaft concreting at the United Verde Copper Co. mine is applied in the main ore shaft and also in the man or material shaft, shown in plan and section in Figs. 1 and 2. In both shafts concrete serves only as a fireproof support for guides and equipment. This being the condition, considerable time and study have been given to a type of construction that will afford a satisfactory installation at a lower cost than can be obtained with solid concrete.

The main ore shaft is first sunk from 200 to 500 ft., and, at 150-ft. vertical intervals, drifts are extended to the position of the material shaft, which is then raised from these levels in full section. Under former methods after completion of the raise, the muck was drawn down 50 ft., or until bad ground was encountered; sills were laid, and the intervals timbered with square sets, after which reinforcing steel and forms were placed and concrete was poured therein by means of a 4-in. wrought-iron delivery pipe from the 500-ft. level, where material hoppers and a concrete mixer were set up. On completion of a 50-ft. section the operation was repeated.

When it became necessary to plan for the section between the 1,950 and 2,400-ft. levels, various methods such as solid concrete walls and dividers, pre-cast concrete sets, and all-steel sets were given careful consideration, and, as an all-steel set or a pre-cast set would require some concrete at the corners and centers, so as to fasten it permanently to the wall, it was de-



Plan
Fig. 1



Sectional Elevation
Fig. 2

Fig. 1—Plan of man or material shaft, United Verde Copper Co.

Fig. 2—Section of man or material shaft, United Verde Copper Co.

Fig. 3—Concrete rings in place. Fig. 3a—Section showing how ring forms are hung

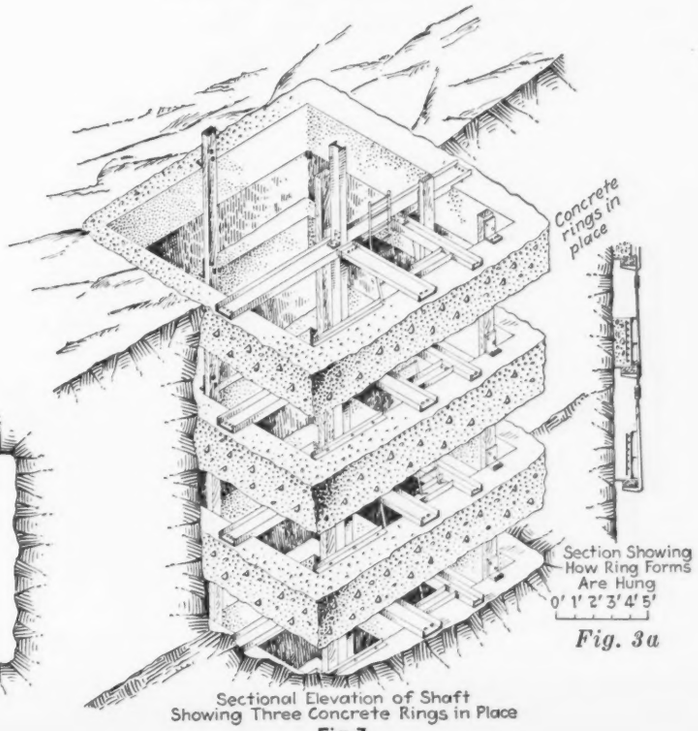
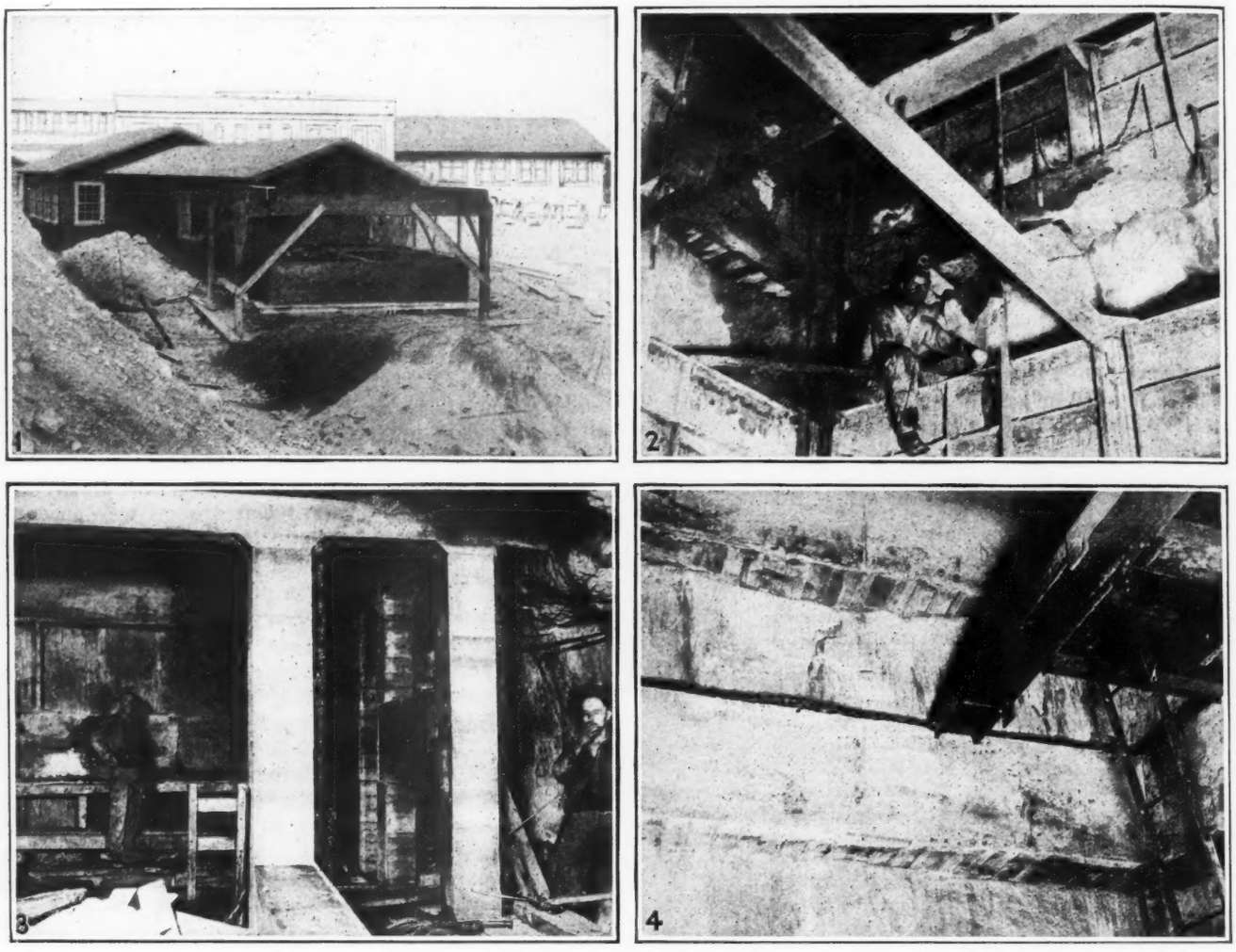


Fig. 3a

Sectional Elevation of Shaft Showing Three Concrete Rings in Place
Fig. 3



Upper left, forms set upon surface. Upper right, three sets of forms hanging in shaft after pouring is complete. Lower left, a station section. Lower right, view after forms are removed and steel partly installed

cided to adopt or invent a method that might be compared to casting wall plates in place, and the present plan, known as the "ring method," was conceived by me and detailed in a general way. It remained for W. J. Flood, concrete foreman, to modify and perfect the general plan and make of it a practical working scheme satisfactory in cost and service.

The method involves the following steps:

1. A wooden sill, framed similar to a shaft set, is hung by means of sixteen 1-in. hangers equipped with turnbuckles from a temporary support, as indicated in Fig. 3*a*. This sill is leveled by means of the turnbuckles and then aligned by means of four plumb bobs, and fastened by tacking eight pieces of ship lap, as indicated in Fig. 3.

2. With the sill aligned and leveled, additional pieces of ship lap are nailed to the sill and so cut that they fit close to the irregular rock wall. Any small openings remaining are stuffed with old cloth or sacking.

3. Re-inforcing steel, as shown in Fig. 3*a*, is then stood on the sill and fastened at the corners so that a steel cage is formed. The re-inforcing steel consists of five $\frac{3}{4}$-in. horizontal and ten $\frac{3}{8}$-in. vertical bars, spot-welded with an acetylene torch before leaving the shop to facilitate installation.

4. When this re-inforcing is in place, the steel form is then stood on edge around the sill. Forms are in eight sections 2 ft. 6 in. high and 7 ft. long, pin-connected at center and corners and braced by means of corner braces and two 4-in. I-beams from the center.

5. Anchor bolts are now set, impression plates for shaft divider I-beams set, and the set is ready to pour. Concrete is poured level with the top of the form, and, therefore, to a height of 2 ft. 6 in. and a thickness of 8 in. or greater, depending on the ground line.

6. On completion of the pour, muck is drawn and a second form hung in precisely the same manner from the sill above at an elevation 6 ft. lower, and this is continued until five sets of forms and five pours of concrete are made. The first set of hangers and the first form are removed and lowered to the sixth position.

7. On removal of the forms, the I-beam dividers are placed as indicated in the completed section.

The following costs indicate the saving by the ring method:

Method	Feet	Excavation	Per Foot	Concreting	Per Foot	Total	Per Foot
Ring...	450	$33,314.00	$77.11	$22,559.48	$50.11	$55,873.48	$127.22
Solid...	1,550	100,891.00	68.17	227,617.00	146.84	328,508.00	215.01
Saving per foot of shaft							$87.79

Detail of above costs:

	Excavation Amount	Excavation Per Foot		Concreting Amount	Concreting Per Foot
Labor.....	$22,449.15	$52.07	Labor.....	$7,459.28	$16.60
Shops.....	117.04	0.26	Engineers....	475.66	1.05
Explosives....	3,750.86	8.47	Shops.....	2,663.58	5.90
Supplies.....	3,311.10	7.68	Supplies.....	11,941.01	26.51
Air.....	870.42	2.08	Miscellaneous	20.00	0.05
Repairs.....	2,815.91	6.55			
Totals.....	$33,314.48	$77.11	Totals.....	$22,559.53	$50.11

Cost per Yard of Concrete Poured

Ring method....	$61.30	Mixture.....	1–2–4
Solid method...	58.80	Mixture.....	1–3–5

Discussion

Depression in Australian Mining

THE EDITOR:

Sir—In the editorial of your issue of Oct. 24 you refer to my letter, appearing in your issue of Oct. 3. From the terms of the reference I judge that my meaning has been misunderstood.

The theme was the depression in Australian mining. Australian labor conditions have been widely blamed for it. I indicated the ultimate cause as being the country's policy with regard to foreign trade. I said that the high tariff policy is, as it obviously must be, increasing the country's production costs and that the exporting industries were accordingly greatly handicapped and burdened. Further, that, of those industries, mining had been by far the most seriously affected, having greatly retrograded, whereas other primary (exporting) industries have remained on the whole stationary during the last few years.

Your editorial interprets me as saying that Australia is an extreme case of self-assertion of the laboring majority, perhaps entailing comparative economic disadvantage inasmuch as the rise in the prices of labor and the shortening of hours have caused many enterprises to become unprofitable and to close; so that the country, in spite of a protective tariff, cannot compete with the world.

This seems to me to be almost reversing my words. You treat the tariff as a help. My main point was that it is the chief cause of trouble to the exporting industries, especially mining, and that it is the cause of dear labor as of other costs. Australia can, of course, compete with the world in her home market. She produces an excess of chief raw materials, and they are cheaper in Australia than in the world's markets by the amount of freights and other charges. As regards other goods, she frames the tariff so that her products can compete.

Your editorial treats my words rather as depicting Australia as a horrible example of labor domination. Nothing is further from my meaning. I was indeed rather combating that idea, which is one that seems to have become somewhat widespread. Nor do I even mean that "Labor" is entirely responsible for the said policy. The great majority of the people outside of the labor ranks are protectionist. But on the whole it does appear that Labor is more extreme in its protectionist views than are the Nationalists, who form the majority of the Anti-labor forces. The Country party is the smallest of the three political groups and is now allied with the Nationalist group against Labor. I was depicting, first, the impoverishing effect of Australia, with her small population and huge area and natural resources, being self-contained, as compared with what she could be; second, the fact that self-containment and a big exporting trade are in her case incompatible; third, certain inconsistencies in her fiscal beliefs.

I agree entirely with your "third-party impression," that Australia is on the whole better off than England; that is, that the average well-being of her people is greater; further, that she is probably safer from serious social disturbances in the future. But these matters are quite apart from what I wrote. As regards average well-being, Australia would be on a still higher plane today but for her tariff (or self-containment) policy.

You allude to the condition of the American worker. From such knowledge as I have, I judge his condition to be comparatively very similar to that of the Australian. His wages (both nominal and real) are higher, but the average income in America is, I understand, also higher—probably in about the same proportion. This does not seem to have been the case before America introduced her immigration restriction and before Australia made her tariff so high. Then I understand the Australian worker was on the whole better off than his American comrade.

I wish to make it clear that my letter inferred nothing beyond what it stated. It was not a general criticism of Australian policy. It simply indicated certain results of that policy. It also expressed doubt as to the Australian public recognizing those results. But if it chooses that policy, while recognizing the results, who is to say it is wrong or right? That is a question whose analysis would be lengthy and whose answer depends upon the values placed by the appraiser on various factors.

Personally I believe that a policy approximating free trade, or of low tariffs, would create in Australia more fully those conditions which are commonly accepted as desirable—that is, the achievable maximum in population, average health and hardihood, wealth per head—than can her present policy. That a day may come when protection of new industries (generally manufacturing) would enable her to support a larger population than otherwise I think is probable. That day is not yet. Its arrival or otherwise will depend partly on the future industrial history of other countries.

Perth, Western Australia. H. R. SLEEMAN.

A History of Pyrites

THE EDITOR:

Sir—As a subscriber to the *Mining Journal-Press*, I am writing you for possible information. I have an old volume in excellent condition, leather binding, and good paper, entitled "Pyritologia, or a History of the Pyrites, translated from the German of J. F. Henchel, late chief Director of the Mines at Freiberg, in Saxony, London. Printed for A Millar, in the Strand, and A. Linde MDCCLVII." On the fly leaf is written "John Waite's Book, 1801."

I will appreciate it if you will advise me whether the book has any value, or if you will refer this letter to the proper parties, who may give me such information.

I am not as anxious to dispose of the volume as I am to ascertain if it is a publication of value. It certainly has created considerable local interest among men who have a knowledge of the subject.

Goldfield, Nev. EDWIN S. GILES.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

MOUNT MORGAN mine resumes operation by open-pit methods after six months' shutdown. Broken Hill sells smelter interests.

Fire destroys valuable records in Guggenheim Bros. New York office.

Dome Mines active in Red Lake district, Ontario—Teck-Hughes increases ore reserves.

Crystal Copper Co. repairs recent fire damage by installing electric hoist.

Pine Creek district, Idaho, to be served by aërial tramway.

Vancouver Island scene of new copper development.

San Francisco Mines, in Mexico, issues encouraging annual report.

Dutch Guiana exports 85,525 tons of bauxite in 1925; British Guiana 174,999 tons.

Chalk Mountain mine, in Nevada, has profitable year—Tybo mines to be reopened—Pioche district has three active shippers.

Old Vulture mines, at Wickenburg, Ariz., to be reopened—Railway planned for Monte Cristo mines—Verde Central has promising ore zones. Southwest Metals to resume smelting.

Overproduction looked for at Joplin, as number of mills increases; weekly yield now in excess of 18,000 tons.

The advisory committee appointed by Secretary Hoover to recommend a program for the reorganization of the U. S. Bureau of Mines has issued its report. Secretary Hoover withholds comment until he has had time to review the report.

Guggenheim Bros.' Files Damaged by Fire

Forty-three stories above the street, firemen early in the morning on Feb. 16 fought the highest fire which any fire department has ever been called upon to control. It had climbed swiftly to the top of a shaft, carrying pipes and electrical wiring, in the Equitable Building, at 120 Broadway, New York. The blaze caused injury to eight men, damaged offices near the top, those of Guggenheim Bros. principally, and for hours defied the efforts of firemen and Fire Department apparatus summoned by four alarms.

Although it is believed that the damage done by the fire may eventually run into tens of thousands, no official estimate has been made as yet. Clarence T. Cauley, superintendent of the building, said that this would be done by the fire underwriters' appraisers and that until then it would be impossible to place a value on the property lost.

The offices occupied by Guggenheim Bros. on the thirty-fifth floor of the building and those of the American Smelting & Refining Co. on the thirty-fourth floor were the principal sufferers, the executive offices of the former looking as though they had been burned out, and valuable records were lost. The only damage suffered by the American Smelting & Refining Co. was that done by water. A little water seeped through to the thirty-third floor, but did only trifling harm. The Equitable Building was said to be the most fireproof in the world at the time of its construction.

Greenway Will Bequeaths $100,000 to Employees

GENERAL JOHN C. GREENWAY, in his last will and testament, which was filed recently in Tucson, bequeathed $100,000 to the employees of the New Cornelia Copper Co. at Ajo, Ariz. The sum of $10,000 was left to his friend William A. Davidson, who, when he found that he was unable to enter the army, stowed himself away on the transport and followed Greenway's fortunes during the hectic days of 1917 and 1918 on the battle fields of France. The rest of the property was left to the general's widow, son, brothers, and sister.

Elm Orlu Takes Option on Mount Washington Mine

Elm Orlu Mining Co., which is owned by the W. A. Clark estate, has taken a working option on the Mount Washington property, situated near Wickes, Mont. The property is owned and formerly was operated by the Angelica Mining Co., sponsored by Charles D'Autremont. A mill was constructed, which burned before it could be put into successful operation. The ore contains copper and zinc in quartz, and the Clark interests plan to beneficiate it at their Timber Butte plant. A 40-hp. electric hoist and a 100-hp. electrically driven compressor have been shipped to the property by a Butte machinery house, and active operations will start before the end of February.

East Helena Plant of A. S. & R. Co. to Be Enlarged

According to advices from Helena, the American Smelting & Refining Co. will spend $100,000 to enlarge its East Helena plant to take care of the increased quantities of lead ores for which it has contracted. Enlargements include additional roasters and blast furnaces.

For some time the management has been looking into details covering arrangements to have low-grade ores of the Helena district concentrated before smelting. It is possible that arrangements will be made with the Jefferson Milling Co. to enlarge its flotation plant at Corbin, with the purpose of taking in custom ore, the resultant lead concentrates to be shipped to East Helena and the zinc concentrates to the Anaconda plant at Great Falls.

W. J. O'Connor, manager of the East Helena plant, who has been with the company for more than fifteen years, has been promoted to become superintendent of the Utah division of the company, effective immediately. Mr. O'Connor's successor at East Helena has not been named.

Alaska Juneau in January

Alaska Juneau mined and trammed 314,800 tons in January, 1926. Total production was $185,400, or 58.89c. per ton. Operating expenditures were $154,700 or 49.14c. per ton, leaving an operating surplus of $30,700 or 9.75c. per ton. Other expenditures and accrued charges totaled $39,900, leaving a deficit of $9,200 for the month. Additions to the milling plant are progressing well.

Tonopah District Production Declines

Tonopah Extension to Be Refinanced to Meet Losses and Current Expenses

Production by the Tonopah (Nev.) district has again shown a sharp decline. For the month of January gross bullion shipped was valued at $179,000. Of this total the Tonopah Mining Co., which is milling Tonopah Belmont ore in addition to its own, shipped $97,000; the Tonopah Extension $43,500; and the West End $38,500. The total is about 25 per cent below normal for the last six months.

Decline in the production of the district is due almost entirely to curtailment by the Tonopah Extension, whose bullion shipments have been decreasing, and its operating losses increasing, since last March. This company, of which John G. Kirchen is general manager, appears to have gone to an enormous expense in the purchase and installation of a first-class Diesel-engine power plant at a time when ore reserves were practically negligible.

In a recent circular letter to stockholders M. R. Ward, president of the company, points out that an emergency has arisen in its financial affairs. Operating loss for the eight-month period ended Nov. 30 was $171,315.61, and the December loss was $45,628.26, making the loss for the last nine months of 1925 total $216,943.87. President Ward states that new financing is necessary to take care of an undetermined additional federal tax for 1919, 1920, and 1921, on which the government has demanded $226,841.89; an unpaid balance of $185,000 on the new Diesel power plant; and to take care of current operating losses, the mine being unable to produce at a profit, owing to shortage of ore and surfeit of water which interferes with development at critical points.

It is proposed to amend the articles of incorporation, to define the present issued stock as "common stock," and to issue 400,000 shares additional of preferred stock, the latter to be preferred as to earnings and capital assets, in case of dissolution or liquidation, up to $3 per share. Present stockholders are to be allowed to take up the preferred stock on the basis of one for four, paying $1 per share for the new preferred, which also carries voting privileges.

Surplus of Ore Looked for at Joplin

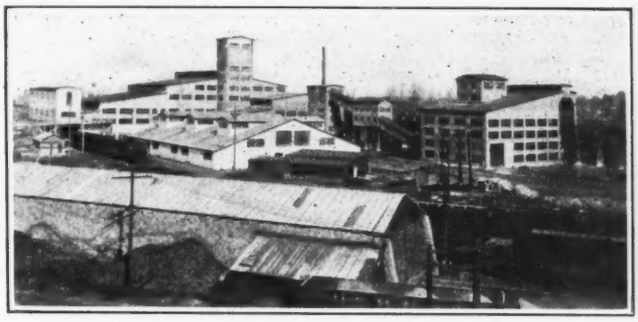
Indications point to an early drop in zinc ore prices in the Joplin-Miami district, because of heavy production. For the week ended Feb. 6, total output of zinc ore was reported by the Tri-State Zinc and Lead Ore Producers' Association at 18,954 tons, and the total number of mills operating as 181. This breaks all previous records for the district. Furthermore, still more mills are preparing to operate, and more mines are being opened for production.

It is the consensus of opinion that production of more than 17,000 tons a week will almost certainly result in a quick accumulation of surplus ore, which, in turn, must inevitably operate to bring about lower ore prices.

Flotation Plant of U. S. S. R. & M. Co.

Operation of the new 750-ton flotation plant of the United States Smelting, Refining & Mining Co., situated about 400 yards from the Midvale, Utah, smelter of the company, will begin on or about March 1. The grinding department has been turned over, and most of the machinery has been installed, so that all that remains to be done is "tuning up" and completing final details.

The new plant embraces a number of novel features. Three departments—grinding, flotation, and thickening—are housed in three separate buildings of the most substantial construction. Construction is of steel and reinforced concrete. Extreme flexibility of operation will permit the company to treat custom ore as well as company ore and to handle a wide variety of products, particularly zinc-lead-silver ores previously deemed not amenable to treatment.



New flotation plant of U. S. Smelting, Refining & Mining Co. at Midvale, Utah

Verde Central Has Promising Ore Zones

In the annual report of the Verde Central Mines, Inc., a subsidiary of Calumet & Arizona, operating at Jerome, Ariz., Gordon R. Campbell, president, says: "We consider the chances for making a paying mine to be good, and exploration work will be carried on with that end in view." The report further states: "Two ore zones have been opened up from the two shafts, one on the contact of the greenstone and porphyry on the 800 and 1,000 levels and one in a fracture zone in the greenstone. The contact orebody so far developed is about 800 ft. long and from two to twelve feet in width. This orebody contains high-grade ore. For a distance of 900 ft. on the 1,000 level, the fracture zone is about 20 ft. wide. It contains a large amount of low-grade ore and an oreshoot about 140 ft. long and 14 ft. wide assaying about 6 per cent copper. General conditions for ore at greater depth are very good and it is planned to explore this ore zone by deeper workings."

Cocomongo Mine Changes Hands

The St. Louis Smelting & Refining Co. is reported to have taken over the Cocomongo mine, Salida, Colo., and has ordered development of the Foster and Baldwin group claims, in the Kerber Creek mining district.

Transportation Assured for Pine Creek, Idaho

Aerial Tramways Will Be Built—A. C. Boyle's Report—No Railway Extension Now

The problem of transportation on Pine Creek, in the Coeur d'Alene district, Idaho, has been solved by the adoption of aërial tramways rather than by the construction of a branch railroad. Last summer an exhaustive study of ore tonnage in that section was made by Dr. A. C. Boyle, geologist for the Union Pacific Railroad Co., and though his report has not been made public, it is known that he found ample tonnage to justify construction of the nine-mile branch. However, the railroad company was evidently not in position to proceed with the construction, and rather than take chances on the uncertainty of a railroad, the Sidney Leasing Co. arranged with the Bunker Hill & Sullivan company to finance the construction of an aërial tramway for the delivery of ore from the Sidney mine to the Star mill at Kellogg. The distance is approximately three and a half miles and the estimated cost of the tramway is $75,000. A contract for its construction has been awarded to the Painter Tramway Co., of San Francisco.

Announcement has now been made that the Constitution Mining Co. will also construct a tramway for the delivery of concentrates from the mill to a terminal on the railroad at Kellogg near the Sidney. The Constitution tramway will be seven miles long, and its estimated cost is $150,000. It is proposed to have these tramways serve as trunk lines, with which lateral tramways from other mines will connect. Sidney's tramway will be easily accessible for the Hilarity, Little Pittsburg, and Nabob mines, and the Constitution can be easily reached by the Highland-Surprise and Douglas. Other properties will be able to make this connection when they reach the productive stage.

Pine Creek ores are zinc-lead, with zinc predominating, and it is evident that the proposed system of tramways will operate to the advantage of the Bunker Hill & Sullivan company in securing zinc for its proposed electrolytic zinc plant and lead for its present smelter. Bunker Hill & Sullivan is remodelling the Sweeny mill to provide custom service for treating zinc-lead ores. This will prove a big help to the small producers that have not plants of their own.

Reynders Committee Would Retain Three Bureau of Mines Stations

Advises Hoover to Abolish All But Pittsburgh, Salt Lake, and One in an Oil District—Non-Metallic Mineral Work Stressed—Against Cutting Appropriations

THE committee consisting of J. V. W. Reynders, C. P. White, F. P. Hanaway, D. M. Folsom, Louis S. Cates, J. G. Bradley, and H. Foster Bain, appointed by Secretary Hoover to make recommendations on the reorganization of the U. S. Bureau of Mines, reports in part as follows:

The mining industries, as a group, occupy a peculiar position differentiating them from either agriculture or manufacturing industries, in that they are based upon limited natural resources which, when exhausted, cannot be reproduced. This fact makes necessary the application to mining of public policies which do not ordinarily apply to other industries. It also makes desirable the segregation of government administrative, regulative, and promotive functions with reference to mining from those with reference to other branches of industry. In most highly civilized countries this fact has been recognized and a Minister of Mines or his equivalent in rank occupies a responsible position in the government.

Genesis of Bureau of Mines

Some twenty years ago consideration of these facts, and the rapidly mounting draft being made on the nation's mineral wealth, led to agitation for the creation at Washington of a seperate Department of Mines with a member of the Cabinet at its head. For a variety of reasons, centering mainly in the fundamental fact that under the existing Constitution the Federal Government does not have regulatory authority over mines, the police power being residual in the several states, Congress deemed it sufficient to create a Bureau of Mines, Metallurgy and Mineral Technology, then placed in the Department of Interior and recently transferred to the Department of Commerce.

Under the broad authority of these statutes but subject to the limitations of specific appropriation acts the Bureau has developed a highly specialized service for study of the technologic problems of the mineral industries and for inculcating the lessons to be derived from those studies. As a means of safeguarding life and stimulating and developing a keen interest in safety in the mines it has maintained a general Safety Service and has borne an honorable part in actual mine rescue work. The "inquiries into the economic conditions affecting these industries" specifically included within the functions of the Bureau have only been made to a limited extent. Its major preoccupation has been with safety and the development of a technology which would reduce waste in production and in utilization of the minerals. The omission of Congress to provide specific funds for making economic inquiries and the preoccupation of the staff with other duties has probably been the direct cause of the failure to occupy the allotted field. Among the consequences may be mentioned the repeated creation of specific commissions and special agencies, such as the Coal Commission, the Senate Committee of Inquiry on Silver, and others which with hastily assembled and temporary staffs have met immediate needs at a high cost.

Reorganization of Bureau of Mines

Transfer to the Bureau of Mines of the Division of Mineral Resources, which as a part of the Geological Survey has long maintained an important statistical service for the mineral industries, and placing the whole in the Department of Commerce where the economics of industry and trade are under constant review, affords an excellent opportunity for developing the further usefulness of the Bureau of Mines in an important direction. It will not be satisfactory to attempt to segregate economic studies entirely from the technologic and engineering aspects of these industries.

Economics and Statistics

Your committee believes that the interests of the several mining industries concerned can be best served by the Department of Commerce by a consolidation of relationships within the Bureau of Mines and therefore recommends the incorporation of a branch of Industry or Economics within the Bureau of Mines and the transfer to the Bureau of the Coal, Minerals, and Petroleum Divisions' work of the Bureau of Foreign and Domestic Commerce, with any others involved, to the extent that the officials of the department may deem it wise or necessary for the accomplishment of this purpose.

For all these reasons, and the practical administrative advantages of centralizing work as far as possible it is believed that correct procedure points to building up in the Bureau, parallel to the present technologic branch, of an Industrial or Economic Branch of the service. To this branch should be transferred such units of the present service as are pertinent together with certain of those now maintained by other bureaus in the department.

With the transfer recommended, of the Coal, Petroleum, and Minerals Divisions of the Bureau of Foreign and Domestic Commerce to the Bureau of Mines, such a consolidation of relationships will be established as should best serve the interests of the several mining industries concerned in the work of the Department.

Safety

The committee recognizes the outstanding importance of the safety work of the Bureau and, pending a more complete study of the work, the committee makes the following minute:

Since the establishment of the Bureau of Mines, one of the important divisions has been the Division of Safety. The work of this division has probably been more widely known and had a more popular appeal than that of all the other divisions combined, because of the humanitarian activities in which it was engaged. Because the laws and regulations governing the actual production of coal are those of the local political divisions in which the mines are situated, the Federal Government is prevented from exercising any legal authority in the matter of safety regulations both as to the protection of life and property. The work of the division, therefore, has had to be supplementary and auxiliary to the organizations set up in the various states for the supervision of mining operations. Because of the limitations placed upon federal safety service by our dual form of government, the object of the Safety Division should be the development of a public opinion within the various states for the creation of such standards of mine inspection and accident prevention and of such adequate facilities as will enable this Bureau to turn over gradually to the individual states the work which properly belongs to them, in the meantime maintaining a high standard in its personnel and continuing unfalteringly its missionary endeavor toward the prevention of accidents, its encouragement of an increasingly higher standard of safety, and the actual rescue work in cases of emergency.

Mining Methods

Study of mining methods as regards safety, efficiency, and conservation of material has properly occupied much of the attention of the staff of the Bureau and absorbs roughly 12½ per cent of the funds. The study and development of mine rescue apparatus is a function of the Safety Service. The admirable system of permissible explosives and machinery is partly administered under the Chief Explosives Engineer and the Chief Mechanical Engineer. The bulk of the studies of mining methods are conducted by the Division of Mining Research. The Chief Mining Engineer acts as advisor to the Director in all lines related to mines. The work of the Division of Mining Research is directed to the development and introduction of safer and more efficient mining methods. It is accomplished in large part through the part time use of engineers who have also other duties, such as supervision of or participation in the work of the Safety Service, or who form part of the staff of the various mining experiment stations. A smaller number of engineers devoted to this single purpose might be more effective from this point of view, though it is undoubtedly advantageous to the work of the Bureau as a whole to have these more advanced research mining engineers scattered throughout the organization.

The organization of the studies of fundamental functions and problems rather than of districts is commended and it is not considered desirable that the publication of a series of detailed descriptions of the methods of particular mines or districts be undertaken by the Bureau.

Non-Metallics

Minerals of the non-metal group, excluding those used for fuels, now produced in the United States, exceed in

value that of the metal output, and amount annually to three-quarters of a billion dollars or more. The total is made up of the output of many small mines, non-metallic mining being usually not organized with large producing units. In general, the industry corresponds rather to farming in that there are numerous small producers selling their output locally and in many instances operations are intermittent. Indeed, a surprising amount of production comes from the farms, the mining being done by farm labor as out-of-season work.

Non-metallic minerals used in industry are numerous and varied. They range from abrasives to soapstone. They vary greatly in characteristics and quality and are utilized in highly technical manufacturing industries regarding which the initial producer has little information. It is characteristic of this field that grading of output is rudimentary and much of the material, gathered in small lots, is sold through brokers. Continually new uses are being found and undoubtedly new sources of supply of better quality or better situated for production remain to be discovered and developed.

The non-metals constitute the great reserve of the mineral wealth of the nation. Long after the forests and the iron, lead, zinc, and copper deposits prove inadequate, brick, stone, slate, gypsum, lime, sand, gravel, and many other of the non-metallic minerals will be available in abundance for structural and other uses. At the same time, even now, our great manufacturing interests are at times handicapped by the inadequacy of local supply of suitable quality of some little considered non-metallic mineral such as garnet or mica.

For these various reasons there is in the non-metallic field a peculiar opportunity for usefulness in (a) research directed toward extending knowledge of the various minerals, and (b) collecting and redistributing such technical and economic knowledge as already exists. In the latter field especially the various trade journals and the trade associations that are coming into being are doing excellent work and in these as in other mineral industries there are individual producers and groups of producers who have well qualified and well directed technical staffs that need little outside help. This is not, however, true generally, and much good can as usual be done in bringing average performance, as nearly as may be, up to the best performance.

In the main, but not always, the mining problems in the non-metallic industry are simple. They tend inevitably to become more complex as the favorably situated surface deposits are exhausted, and in time the highest skill of the miner will be generally, as it is now frequently, needed. Already, the limestone industry is changing rapidly from quarrying to underground mining. Fluorspar and many other of the less well-known non-metallic minerals are mined, and yet, because of the history of its development, those now in the non-metallic industries seldom have that basic knowledge and experience in mining that is widespread and fundamental in metal and coal mining.

In the preparation of the non-metallic minerals for the market the processes of sorting, crushing, sizing, grinding, blending, and grading are all common processes of ore dressing. Wet and dry concentration, leaching, and flotation, all have their field here. Drying, roasting, sintering, and even smelting are also familiar processes. Indeed, a blast furnace may be run, according as local economics dictate, to make either iron, cement, or fertilizer the main product, with the other two secondary; and machinery developed for metal mining or treatment is constantly finding use in non-metal production.

In connection with the statistical service of the Geological Survey, now a part of the Bureau of Mines, and in response to a multitude of inquiries addressed direct to the Bureau, there has grown up an information service at Washington which serves a wide need, especially in connection with the non-metallic industries and which, to meet its demand, continually requires the making of small researches. In the past these were conducted at the various field stations of the Bureau as proved most convenient in each case, but since 1917, the work relating to ceramics proper has been centered mainly in the station at Columbus, Ohio, and since 1922 the greater part of the other work on non-metallics has been done at a specially equipped experiment station conducted in co-operation with Rutgers College, at New Brunswick, N. J.

In correspondence and discussion with representatives of eighteen trade and producers' associations operating in the non-metallic field, it has become clear that these associations are distinctly favorable to the continuance of the activities of the work of the Bureau of Mines and are disposed to co-operate freely with it. Minor criticisms only are made; mainly to the effect that not enough was done, as where a more minute classification in the statistical work is asked. The work of the Bureau of Mines for the non-metallic industries evidently enjoys the high confidence of those it has served.

Metallurgy and Ore Dressing

We believe that the major portion of the Bureau's technical work should be devoted to fundamental problems of wide application. Among the reasons for this are that private enterprises are concerned chiefly with problems peculiar to their own properties and are not directly interested in the dissemination of results of their experiments; that the Bureau is or can be equipped to cover a wider range of investigation than any private concern does or is likely to cover and that the Bureau has and will have access to more information from more localities than any private organization has or is likely to have. Any progress achieved along fundamental lines will be of greater public benefit than work on some special or local problem. Therefore, we believe that the Bureau should devote at least 60 per cent of its activities to the fundamentals and the rest to minor or local conditions.

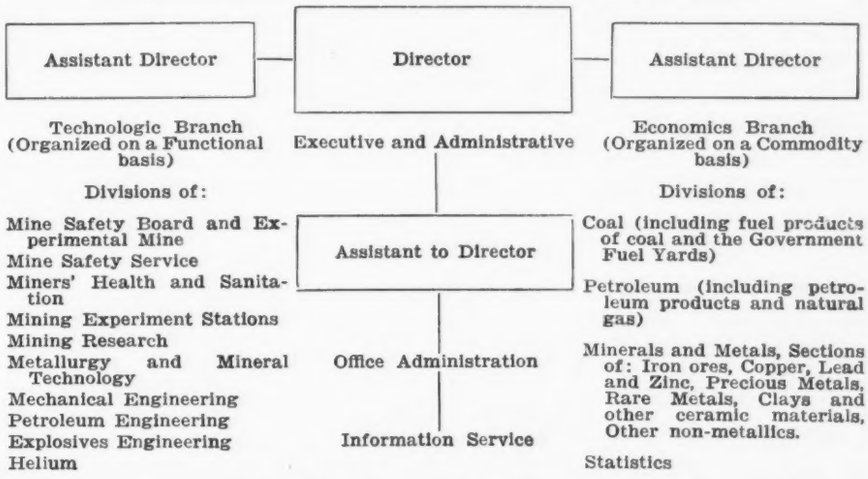
Consolidation of Stations

It is recommended that the work of the small stations be consolidated into three units, located at Pittsburgh, Salt Lake City, and one at a point where the oil industry could be well served. Three stations so situated could be built up into efficient units where brains and apparatus could be consolidated under more efficient leadership and supervision than is possible with many small struggling units.

As to the subjects that should be investigated, there are so many fundamental principles that need development that we see no danger of the Bureau finding it necessary to expend its energies on any subjects that would benefit comparatively few. An investigation once started should be carried to a final conclusion. By this is meant that there is no forbidden ground for the Bureau; they should carry on until the process or development has been brought to an indicated commercial success, or definite conclusion of a purely technical subject. In other words, it would be better if all the appropriation were spent on one subject that brought forth a definite development than to dribble away small amounts on many subjects.

It is perfectly evident that the suggestion of abandoning the small stations will not be popular with the politicians or the heads of the institutions where the stations are now located. It would be better business to turn the

Proposed Reorganization Chart for Bureau of Mines


Assistant Director
Director
Assistant Director
Technologic Branch (Organized on a Functional basis)
Executive and Administrative
Economics Branch (Organized on a Commodity basis)
Divisions of:
Divisions of:
Mine Safety Board and Experimental Mine
Mine Safety Service
Miners' Health and Sanitation
Mining Experiment Stations
Mining Research
Metallurgy and Mineral Technology
Mechanical Engineering
Petroleum Engineering
Explosives Engineering
Helium
Assistant to Director
Office Administration
Information Service
Coal (including fuel products of coal and the Government Fuel Yards)
Petroleum (including petroleum products and natural gas)
Minerals and Metals, Sections of: Iron ores, Copper, Lead and Zinc, Precious Metals, Rare Metals, Clays and other ceramic materials, Other non-metallics.
Statistics

stations over gratis to the institutions, for in the last analysis these stations were created, in a great measure, to get political support for the establishment of the Bureau, and therefore have served their purpose. We see nothing in the argument that these small stations scattered over the country help disseminate information. Those who seriously desire help or advice would not be deterred because it was necessary to correspond with a central station. If the subject needed personal investigation, an engineer could be sent out from headquarters.

The Bureau of Mines has no police power and no right of entry to mines or plants. Neither has it any mandatory authority giving it access to the books or papers of companies and industries. It depends on the co-operation and good will of the industries in collecting data. It is most important that this good will be not lost and that the confidential character of individual returns be respected in the fullest degree. Accordingly, it is recommended that neither the Bureau nor members of its staff be used in connection with prosecutions by the government or the states, for infraction of laws, or in determining damages in civil suits.

PETROLEUM AND NATURAL GAS

The work of the Petroleum Division of the Bureau of Mines has been helpful and of direct value to the oil industry.

It has included:

1. The collection and publication of statistics covering production and refining of petroleum.

2. Investigation of operating methods within the industry with a view to reduction of losses in the production, storage, and transportation of crude oil and petroleum products—and dissemination of information in regard to improvements in operating practice.

3. Research work into the characteristics of oils and products as produced in different fields and research in methods of distillation of oils and the treatment and utilization of products.

It is recommended that the collection of statistics be transferred to the proposed economic branch of the Bureau and that the method of collection and form of publication of these statistics be carefully revised to make these figures more accurate and in consequence of greater value to the industry.

The investigation of operating methods has involved field work and the study of specific problems in different fields. It has, therefore, been conducted from stations established in the vicinity of oil fields. This work has been welcomed by the oil industry and has been of great benefit in many cases. It has led to co-operation between the Bureau and various units of the industry, and in the investigation of individual problems. This direct contact between the Bureau and operating companies has been particularly valuable. It is recommended that this field work in study of operating methods be continued and strengthened by careful planning and direction. More complete co-operation with the industry should be secured through advisory committees and such other channels as are available.

Handling Rock or Ore Chief Cause of Accidents at Joplin

APPROXIMATELY one-half of the accidents to miners in the Joplin-Miami district occur in the course of handling rock or ore, according to a statement of R. V. Ageton, safety engineer with the Tri-State Zinc and Lead Ore Producers' Association. His detailed statement of the cause of accidents for the month of December is as follows: From handling rock or ore, 49.5 per cent; drilling, 13.9 per cent; haulage, 13 per cent; fall of rock or ore from roofs of mines, 5.7 per cent; handling explosives, 0.4 per cent; from electrical machinery, 0.4 per cent; shaft and other accidents, 25 per cent.

Of the 292 mine accidents during the month, 94 happened to shovelers. Carpenters suffered the most accidents at surface plants. More than 19 per cent of all accidents were to the eyes and 17 per cent to the fingers.

Alaskan Developments

A new mine is being developed on Baker Island, near Wrangel. The ore is rich in lead, but also carries gold, silver, and zinc. A test shipment was made to the Trail smelter and gave returns of $150 a ton. Alaska Matanuska Coal Co. has completed construction of bunkhouse, bunkers, and trestle, and will soon be producing coal at its mine at Moose Creek. C. J. Linke, who brought in the Fort Norman well for the Imperial Oil Co., has been locating oil leases at Chickaloon and prospecting seepages at Cache Creek, in the Fairview district.

A California syndicate which acquired the Cliff and Granite mines, at Valdez, has arranged to start development under the direction of L. A. Lavensaler. The Cliff mine operated between 1909 and 1914, and produced gold to the value of over $1,000,000, paying large dividends. A quartz vein carrying high gold values is reported to have been found in the Ohio mine, on the divide between Spruce and Little Eldorado creeks, near Fairbanks.

J. McPherson and E. B. Bigham, engineers for the U. S. Smelting, Refining & Mining Co., have been examining the Yukon Gold Co.'s pipe line at Dawson with a view to its purchase and removal to Fairbanks. They went by airplane from Fairbanks to Eagle, and intended going on to Dawson, but were refused a permit by the Canadian Customs, so had to take dog team for the rest of the journey, occupying three days.

Discovery of a silver-lead deposit, of which outcrops are traceable for several miles, is reported from Koyukuk. W. Rowden, who bonded for British capital 16 miles of auriferous ground at Koyukuk, has cabled confirmation of his options and advised provision of the necessary capital for development and equipment with a hydraulic plant. Water will be conveyed to the ground by a 30-mile pipe line from the middle fork of Hammond River.

About 150 men are employed this winter at Nome by the U. S. Smelting Refining & Mining Co., which took over the Hammon Consolidated Goldfields Co. holdings, and is arranging to operate this year on an extensive scale.

Noranda Incorporated as a Town; Americans Barred from Council

A bill incorporating the town of Noranda, embracing the holdings of the Noranda Mines, in Rouyn Township, Quebec, was adopted by the Private Bills Committee of the Provincial Legislative Assembly on Feb. 2, with some modifications. The names of three American engineers mentioned as members of the first municipal council were stricken out and the names of three Canadians substituted, aliens not being eligible for civic offices. A clause providing that the properties of the Noranda Mines should be exempt from local taxation was warmly opposed by several members. J. Y. Murdock, president of the Noranda Mines, addressed the committee. He said that the expenditure of the company on the town would be approximately $6,000,000, and their outlay, apart from the town, would be about $4,000,000. After a keen debate the clause was amended by limiting the exemption to a term of years ending in 1939. When the bill was reported to the House the fight against the exemption clause was renewed in committee of the whole, a motion to strike it out being defeated.

Wierton Steel Co. Building Additional Mills

The Wierton Steel Co., operating at Wierton, W. Va., took another step in its $15,000,000 improvement plan when it awarded the contract for the construction of eight additional sheet mills to the McClintic-Marshall Co., of Pittsburgh. The buildings will require 1,200 tons of structural steel. The company expects to let the contracts for the car dumpers and ore bins for the new blast furnace at an early date.

Silver-Manganese Mining Co. Incorporated

Roy D. Smith, mining engineer, and associates have incorporated the Silver-Manganese Mining Co. to operate the "Frisco" group of claims at Philipsburg, Mont. An electric power line is being run to the property, the shaft will be unwatered, and the lead-zinc-silver vein will be developed at depth. A 50-hp. electric hoist and 100 hp. electrically driven compressor have been installed.

Mining on California's Coast Ranges

The Palisades Mining Co. is reopening the Grigsby silver mine, near Calistoga, Calif., and has a force of thirty-five men engaged in exploration and development. Equipment at the mine has been overhauled and modernized. The property is an old one and has been idle for a number of years.

Federal Relinquishes Option On Sally Mine

Federal Mining & Smelting Co. has relinquished its lease and option on the Sally mine, at Beaverdell, in the Boundary district of British Columbia, after paying a cash deposit of $10,000 and half of the proceeds of the ore that has been shipped during the five-months' tenor of the option. Federal undertook to purchase the outstanding 10,000 shares in Wallace Mountain Mines for $54 per share in six months or lose its deposit and half the proceeds of the ore shipped.

Relinquishing of the option has come as no surprise to mining men in the province, for it is known that the Federal is seeking properties suited for large-scale work. The veins on Wallace Mountain carry a high silver and low lead content, but they are narrow and much faulted. Faulting gives rise to oreshoots, and these have to be followed closely, and even then sometimes are lost. Federal drove a deep-level tunnel, with the view of opening up the deposits at depth by crosscuts and drifts, but found that the veins are not suited to this kind of development. Wallace Mountain Mines will resume control of the mine and continue to develop it in the old way, which yielded a profit of several hundred per cent on the outstanding capital in 1924.

Fire Destroys General Offices of Boston & Superior Co.

The two story building which housed the general office, engineering office, and supply warehouse of the Superior & Boston Mining Co. at Copper Hill, Ariz., was recently destroyed by a fire of unknown origin. Building and contents were a total loss aside from the records, which were stored in the concrete vault. The total amount of damage is estimated at $20,000, of which $10,000 was covered by insurance.

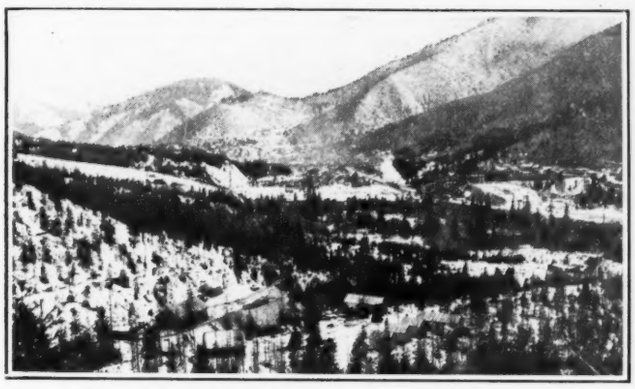
Tybo Mine to Be Opened

It has been reported that the F. W. Bradley interests have decided to proceed with development work on the old Tybo mine, at Tybo, Nev., 70 miles northeast from Tonopah. The shaft is to be repaired and sunk below the 400 level, and lateral development is contemplated. W. H. Blackburn, formerly manager for the Tonopah Mining Co., at Tonopah, is in charge.

Atlas Mining Co. Developing Mine Near Mullan, Idaho

The tunnel equipment plant of the Atlas Mining Co. operating near Mullan, Idaho, was completed in December last, and two shifts are now employed in driving a 7 x 8½ ft. tunnel. During the first fifteen days of January the tunnel was advanced 186 ft., with only fourteen men employed. The tunnel has passed from the Wallace formation into the St. Regis, and results are encouraging.

Gold Hunter Mines, Inc., as a corporation, has no interest in the Atlas Mining Co., but Thomas F. Kelley, of Chicago, is a majority stockholder in both companies. Earl Greenough, who organized the company about two years ago, is general manager.



View of Mullan, Idaho, and vicinity
Atlas tunnel buildings in the foreground

Plant of the Atlas tunnel, Mullan, Idaho
National mill in upper right-hand corner

Pioche District Ships 1,750 Tons Per Week

Ore shipments from the Pioche district for the week ended Feb. 7 were as follows: Combined Metals Mine, 1,500 tons; Black Metals, 150 tons, and the Bristol Silver Mines, 100 tons, a total of 1,750 tons. Complete electrical equipment has been installed at the Bristol Silver Mines, the installation including a 2-mile pipe line to furnish water for the plant, power being transmitted from Jack Rabbit over the mountain to the Bristol Mines.

Development work is being prosecuted at the Prince Consolidated mine, about sixty men being employed. The diamond drilling campaign is proving valuable in locating the orebodies. Drill holes are being run from the 835-ft. level. Plans of the management include the construction of a milling plant to treat the base ore now being proven, but before such a plant is built ore will be blocked out.

At the Combined Metals mine an increased tonnage is being mined, the new orebodies furnishing an excellent grade of milling ore for its plant at Bauer, Utah. At the Black Metals mine, another Snyder property, manganese ore of excellent grade is being shipped to Utah points.

Arcadian Copper Re-elects Directors

At the annual meeting of Arcadian Consolidated at Houghton, Mich., held on Feb. 9, the retiring directors were re-elected. Receipts in 1925, including cash from assessments Nos. 1, 2, and 3, were $86,710.04; disbursements were $70,962.29; and cash on hand, Dec. 31, was $15,747.75. The following amounts are still due on assessments: No. 1, $2,946; No. 2, $7,531; and No. 3, $15,596. Operations during the year were confined to development work on the 1,250 and 1,850 levels of New Arcadian shaft. Total openings were 1,950 ft.

At the Cliff mine exploration of Calumet & Hecla Consolidated, drifting continues north and south on the Calumet amygdaloid vein, which has been opened 100 ft. in one direction and 150 ft. in the other. Copper values persist throughout, but are not yet commercial. In the crosscut in the La Salle lands of the company, good progress is being made. A number of amygdaloid lodes have been cut, but no values of consequence have yet been found.

Teck-Hughes Increases Ore Reserves

At the Teck-Hughes mine, in the Kirkland Lake area of northern Ontario, the mill is now operating at an average of over 7,000 tons of ore monthly, close to 5,000 tons of which is coming from development—a fact which indicates the large amount of developed ore being placed in reserve. It has become apparent that the high-grade ore bodies found at the eleventh, twelfth and thirteenth levels are separate and distinct from what had formerly been regarded as the main deposit. A crosscut at the tenth level has also intersected high-grade ore.

Tennessee Copper & Chemical Co. Acquires Fertilizer Plant

The Tennessee Copper & Chemical Co. has announced that it had acquired the plant and good will of the Calumet Fertilizer Co. at New Albany, Ind., and will operate it as a subsidiary. A new company has been formed to take over the plant, the Calumet Fertilizer Corporation.

Group Life Insurance for Mine Employees

VINEGAR HILL ZINC CO. and Century Zinc Co., operating under joint management in Baxter Springs, Kan., and Picher, Okla., have presented their employees with group life insurance in the Metropolitan Life Insurance Co. More than 350 employees are participating in the insurance plan, for a total protection of nearly $200,000. Each employee receives the immediate protection of $500 insurance. This amount is increased $100 a year until a maximum of $1,000 is attained.

Besides exemption from medical examination and the elimination of age restrictions, the insurance policy carries a total and permanent disability provision which guarantees a temporary fixed income to any employee becoming totally and permanently disabled before reaching sixty years of age. Should such a condition develop, the disabled employee receives the full amount of his insurance in monthly installments for a stipulated period.

A free visiting nurse service and the periodical distribution of pamphlets on health subjects and sanitation also are included in the general plan.

Croff Mining Co. Purchases Cave Mine

Purchase of the old Cave mine, in the Bradshaw district, Beaver County, Utah, has been made by the Croff Mining Co., operating a few miles from the newly bought mine. This mine, first worked in 1859, is one of the oldest properties in Utah. In the last twenty or thirty years the property has not been worked. The Croff company will develop the property at depth, and is also developing the Croff mine, in the Lincoln district just over the mountain from the Cave mine.

Old Sport Mine, Vancouver Island, Being Developed

The Consolidated Mining & Smelting Company of Canada is very active in the northern end of Vancouver Island. It has had forty to fifty men on development work at the Old Sport copper mine for some time and has been exploring the Pilgrim group with a diamond drill. Recently it took an option on the Caledonia group. Its hydraulic engineers have been surveying water-power possibilities for a mill at the Old Sport mine.

Lithium Minerals in Manitoba

Lithium minerals are known to occur in only one deposit of possible commercial value in the British Empire. This occurrence lies, according to Dr. J. F. Wright of the Canadian Geological Survey, within the Province of Manitoba. An outcrop of massive lepidolite was discovered in 1924 about one mile south of Winnipeg River and ten miles east and a little north of Pointe Du Bois.

Johannesburg Letter

By John Watson

Special Correspondent

Transvaal Produced 9,599,702 Oz. Gold in 1925—New Platinum Discovery Reported

Johannesburg, Jan. 12—Crushing results for December have recently been published as follows. The leading mines are arranged in the order of profit earned:

	Tons Crushed	Revenue or Value	Costs per Ton Crushed s.	d.	Estimated Profit
Government Areas.....	159,000	£302,334	16	11.9	£170,282
New Modder.	122,500	263,955	17	9.5	154,995
Crown Mines.	202,000	276,706	19	2.1	83,012
Modder Deep.	44,200	99,788	15	3.0	66,025
Springs.....	67,800	127,373	20	0.7	59,368
New State Areas.....	73,000	127,418	19	4.0	57,180
Van Ryn Deep	65,500	102,279	16	1.7	50,638
Geduld.....	80,500	119,309	17	5.0	49,209
Brakpan.....	76,000	121,551	19	8.7	47,580
Modder B....	64,000	109,375	19	4.2	47,442
City Deep....	88,000	139,317	24	3.6	32,379
West Springs.	47,100	73,071	17	8.9	31,238
Randfontein...	180,500	196,964	18	10.7	30,057
Robinson Deep.....	73,000	.....	17	6.6	28,410
Modder East.	34,000	63,048	25	2.1	20,250

Monthly output of gold for December was declared by the Transvaal Chamber of Mines as 791,455 oz., having a value of £3,361,887. These figures show an increase of 3,822 oz. and £16,234 in value over the November output. Total output of Transvaal gold for 1925 was 9,599,702 oz., which is a record for the industry, being 2,068 oz. increase over the 1924 total. The realized value of the 1924 output, however, was higher than last year's as the gold premium was operating in 1924.

NEW GEOLOGICAL MAP OF SOUTH AFRICA

A new geological map of the Union of South Africa has just been issued by the Geological Survey. It is printed in colors on a scale of one to a million (15.77 miles to the inch). The size of the map is approximately 6½ x 5 ft. and comprises four quad crown sheets on paper. A short explanation has been prepared by the Director of the Geological Survey. The map is obtainable from the Government Printer, Pretoria, and the price is 25s. post free within the Union; elsewhere £1 6s. post free.

The latest discovery of platinum is reported from the farm Onderstepoort, which is about eight miles north of Pretoria. In 1906, Dr. Molengraaf wrote of norite and dunite formations on this farm. Recently, samples have been assayed, showing that platinum is present in payable quantities. A Pretoria company has been formed and has secured an option over 5,250 acres. Two railway lines cross the farm, on which is also located the Bon Accord Dam.

On the Johannesburg Stock Exchange during the last week, gold shares have been firm. New State Areas advanced from 44s. 6d. (with a dividend of 1s. 6d.) to 46s. 6d. ex dividend. Government Areas were also in demand. T. C. Lands have again been largely dealt in, both for London and local demand. There price has risen from 67s. to 69s. 6d. P. p. rust platinums were active at 11s. 9d. to 12s. 3d. and Transvaal Platinums receded to 29s. Northern Transvaal (Messina) coppers have been in good demand and rose in price from 3s. 6d. to 4s. 2d.

Russia Makes Magnetic Surveys in Kursk District—Iron Ore Deposits Revealed

After surveys and borings extending over several years, the Supreme Economic Council of the Soviet Union has made a report on iron-ore reserves in the Kursk district, 300 miles south of Moscow, Russia. A synopsis of the report received by the Russian Information Bureau states that for years the Kursk district has been known as the location of marked magnetic irregularity. The council selected a committee in 1919 to make thorough surveys, and the work was completed in the closing months of 1925, during which the scientists concentrated on the northern zone.

The committee took observations at 15,000 points, as compared with 4,200 points covered by the late Professor Leist. This made it possible to draw up a correct magnetometric map and to conduct test drilling operations in the most accurate manner. Borings were made over a distance of 91 miles. Deposits were found at depths of from 265 to 460 ft. As a result of all the operations it was established that the ore-bearing stratum of the northern zone stretches in an unbroken subterranean ridge southeasterly from Shchigry and Tim counties, 190 miles.

Southwest Metals Co. to Resume Smelting Operations

The furnaces of the Southwest Metals Co. at Humboldt, Ariz., are being fired up, and the smelter will be in full operation at an early date. During the two years the smelter has been shut down the company has been buying ore and now has on hand about 30,000 tons. The Bluebell mine, at Mayer, which is owned by the Southwest Metals Co., will continue to send its output to the smelter, and a number of other mines of the district will obtain better freight rates and smelting rates by diverting their production to the Humboldt plant. Copper ores only are at present being treated, but it is possible that a lead furnace may be added later.

Bingham Mines Earned $10.30 Per Share in 1925

Net earnings of the Bingham Mines Co., operating properties at Eureka and Bingham, Utah, for the year 1925 aggregated, after taxes, approximately $516,000, as compared with $272,000 for 1924 and an average of $301,000 annually for the last ten years. Profit during 1925 on the 50,000 shares now outstanding equaled $10.30 a share.

At Christmas the company distributed $29,000 to employees, pro-rated over the last three months of 1925. December net earnings, after the deduction of $10,000 for the Christmas gifts to employees, totaled approximately $41,000.

Melbourne Letter

By Peter G. Tait
Special Correspondent

Mount Morgan Resumes Work With Open-Pit Mining

Melbourne, Jan. 13—Mount Morgan has reopened operations on a small scale. When work ceased in August last 1,400 men were on the payroll, but, as a result of the fire, the mine was flooded, and it has therefore been decided to try out, on a limited scale, the possibilities of open-cut mining, followed by concentration, roasting, and reverberatory smelting. The ore to be mined lies above the Linde level. After being broken it will be passed into a chute on to a conveyor belt and thence to the main shaft. Approximately 350 men will be employed under the prospective scale of operations. To effect economies in the power house a pulverized-coal plant is being installed.

Broken Hill Proprietary Sells Smelter Interests

Broken Hill Associated Smelters, Proprietary, Ltd., at Port Pirie, was formed in June, 1915, to take over from the Broken Hill Proprietary Co. the Port Pirie smelters. The new company had a nominal capital of £750,000 in £1 shares which were held as follows: North Broken Hill, £200,000; Broken Hill South, £200,000; Broken Hill Proprietary, £200,000; Zinc Corporation, £100,000.

An official announcement just published states that "The North Broken Hill, the Broken Hill South, and the Zinc Corporation have purchased from the Broken Hill Proprietary Co. the latter's share interest in the Broken Hill Associated Smelters Proprietary, Ltd., which owns the large silver-lead smelter and refinery at Port Pirie, in South Australia. The three companies —North, South, and Zinc Corporation— commanding the larger ore reserves at Broken Hill, now become the sole shareholders in the smelter company, which caters for the whole Broken Hill field. Lead concentrate production of the Broken Hill Proprietary mine at Broken Hill will, under the new arrangement, be purchased by the Associated Smelters.

"At Port Pirie an extensive construction program is now in progress, which when completed should render the works of the Associated Smelters as efficient as any of their kind in the world. Neither expense nor effort is being spared to preserve this important industry in Australia."

This announcement does not come as a surprise to those acquainted with the Broken Hill field. The Proprietary mine is approaching the end of its life, and the company is devoting all its energies to development of the iron and steel works at Newcastle. Funds received for the sale of its shareholding in the Broken Hill Associated Smelters will find a sound investment in other directions.

Only one company in Australia is now manufacturing copper wires and cables—namely, the Metal Manufacturing Proprietary, Ltd., at Port Kembla, and it is claimed that the company is in a position to handle considerably more than the present Australian consumption; moreover, the only Australian producers of copper are interested in the company. Notwithstanding this, however, the prospectus of a new company has been issued, the Australian Wire & Cable Works, Ltd., and should it reach the manufacturing stage it will apparently be necessary for copper to be imported.

Electrolytic Zinc Buys Tasmanian Metals

The Electrolytic Zinc Co. has bought the plant of the Tasmanian Metals Extraction Co. at Rosebery. This plant was erected about 1909 to operate the bisulphite process for the treatment of zinc sulphide ores. The company was an offshoot of the British Metal Extraction Co., of which Martin Fradd was the managing director. Tasmanian Metals Extraction Co. entered into a contract with the Tasmanian Copper Co., Ltd., for the output of its Rosebery mine and had also an option over the Mount Read mine. As the treatment company did not actually begin operations, the contract with the Tasmanian company was ultimately canceled, and the mine is now the property of the Electrolytic Zinc Co. With the present purchase the company will also acquire the Mount Read mine, so that it now holds the principal mines in the Mount Read and Rosebery districts.

The Electrolytic Zinc Co. has erected a milling plant at Zeehan, to carry out experimental work to ascertain the best methods of treating the ores. As the Broken Hill field can meet the requirements of the Risdon works for many years, it is not outside the bounds of possibility that the company may ultimately decide to erect electrolytic zinc works on the west coast.

Palladium on Prince of Wales Island

There is a revival of interest in the mineral resources of Prince of Wales Island. The Salt Chuck mine is milling 350 tons of ore a day, and producing a substantial amount of palladium, in addition to gold, silver, and copper. The palladium is marketed at Irvington, N. J. New York parties have been investing the Big Jumbo mine, with a view to reopening it. The Barefoot, Peerless, and Coast Mines Consolidated, near Ketchikan, have been amalgamated. These properties cover thirty-six claims, in which the developed ore is said to average $28.70 per ton. A thirty-ton mill is being installed.

Pioneer Syndicate Takes Over Cooper and Minto Mines

At Michipicoten, in the Algoma district of northern Ontario, the Cooper and Minto gold properties have been merged in one $2,000,000 concern under the auspices of the Pioneer Syndicate, which is allied with the Huronian Belt Co. This syndicate agrees to spend $150,000 on the property in 1926. Machinery to the value of $60,000 will be moved to the property, beginning in March, and camps will then be erected. A contract with the Michipicoten Falls power plant has been signed.

London Letter

By W. A. Doman
Special Correspondent

Foreign Concessions in Russia Amount to 40,000,000 Rubles

London, Feb. 2—A new journal has made its appearance in London, *The Soviet Union Monthly*. In an article dealing with foreign concessions in Russia it is pointed out that foreign concessionary enterprises have an invested capital of about 40,000,000 rubles, which, with prospective development, will reach approximately 100,000,000 rubles. Although not so stated, these would seem to be mainly mining concessions, for special mention is made of the Harriman Concession, the Lena Goldfields, the Ayan Corporation, a concession in the Primorskoi Province, and the British Pri-Amur Syndicate.

Because Krassin is coming to London there is talk of an arrangement with the Russo-Asiatic Consolidated. On a previous occasion when he approved a plan for working the properties his decision was reversed on his return.

Much discussion is taking place about the Russo-Asiatic. Leslie Urquhart takes up what is generally regarded as a sound attitude in relation to the return of the concessions, though others are said to be ready to come to almost any arrangement so long as they can dispose of a block of shares. No official information is obtainable.

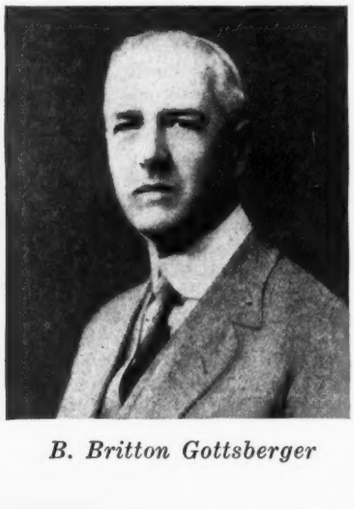
Lena Goldfields has, it is said, signed a contract with the Workers Union raising wages by 12 per cent to 11½ rubles. In case of dismissal the workers will receive a month's wages.

Rhodesian Congo Border Concessions proposes to issue 50,000 "A" shares of £1 each. These will rank with other shares except that each "A" share will carry the right to twenty votes on a poll. These shares are to be offered to existing shareholders in the proportion of one new for each five ordinary held. So far no explanation has been given of the extraordinary voting rights, which no one can understand, in consideration of the fact that the shares will be in the hands of all and sundry. If the "A" shares were restricted to the promoters or vendors, the matter would be clear.

San Francisco Mines of Mexico's annual report is an encouraging document. Ore reserves total 602,000 dry metric tons assaying 408 grams of silver per ton and 9.7 per cent lead, of which approximately 500,000 tons assay over 16 per cent zinc. In addition there are partly blocked out 170,000 tons of sulphide and oxidized ore averaging 461 grams of silver and 11 per cent lead, with the bulk of the tonnage giving 16.7 per cent zinc. No account has been taken of ore below the lowest levels, or beyond the limits of the present mine workings. The metallurgical process was changed in February, and milling results were improved, the lead concentrate in September, the last month of the company's year, assaying 62.51 per cent lead with 9.1 per cent zinc, and the zinc concentrate 50.5 per cent zinc with 3.2 per cent lead.

On the Program of the A. I. M. E. Meeting

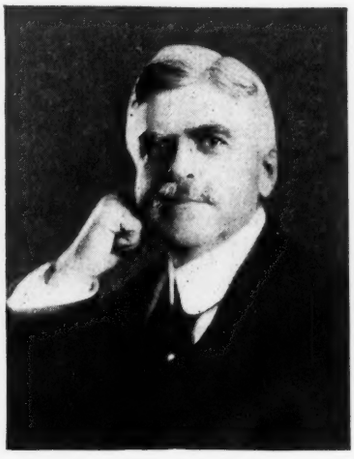
Hoyt S. Gale



B. Britton Gottsberger

Galen H. Clevenger

Wilbur A. Nelson



George S. Rice

H. Ries

The extensive program prepared for the 133rd meeting of the American Institute of Mining and Metallurgical Engineers, held in New York Feb. 15 to 18, included papers and addresses by over 150 engineers and executives of the industry

George D. Van Arsdale

A.I.M.E. Holds Annual New York Meeting

Samuel A. Taylor Elected President—Program Varied, Petroleum Receiving Most Attention—Bear Mountain Bridge and Vehicular Tunnel Visited—Sessions End With Banquet at Waldorf

Staff Report

WITH an attendance surpassing that of last year, the 133d meeting of the American Institute of Mining and Metallurgical Engineers held Feb. 15-18 in New York, achieved the success that has become customary for these annual gatherings in the metropolis. The success of these affairs depends upon two things: the attendance and the program, with the latter the less important. Given a large number present from all sections of the country, as in this instance, with the resultant opportunity to make and renew acquaintance, a meeting is bound to have an interest, to which excellence of the program can only add.

Promptly on Monday morning, Feb. 15, the meeting began in the Engineering Societies Building, the headquarters of the Institute. Separate sessions were devoted to the subjects of petroleum, mine ventilation, non-ferrous metallurgy, milling and concentration, non-metallic minerals, mining methods, coal, iron and steel, and industrial relations. The Institute of Metals Division held its own meetings. A conference on ground movement and subsidence completed the list of major topics. The "sessions" best attended were the daily luncheons, held in the building; the smoker at Mecca Temple on Monday evening; and the banquet at the Waldorf, without which the annual meeting could not properly end. But the technical sessions were by no means slighted.

H. Foster Bain
Secretary of the A.I.M.E.

Business Meeting Given Right of Way

Despite the fact that no session was scheduled for Tuesday morning, so that there might be no conflict with the business meeting which was held at that time, the attendance, while good, was no greater than last year, and was but a very small per cent of the registration. J. V. W. Reynders, retiring president of the Institute, presided. The report of the secretary was presented by H. Foster Bain, who briefly summarized the condition of the Institute and recited the salient features of the last year's work. The Institute needed funds badly to support special research fellows, or assistants, to organize, record, and direct research work in various fields, the report declared. An almost limitless opportunity existed through the Institute membership, by proper correlation, to increase the sum of human knowledge applicable to its work. As to membership, the total was 8,602 on Dec. 31, 1925, as against 8,818 a year ago; 600 applications were received during the year, of which 574 were elected. Of these 553 accepted and became members. Eighty-nine papers were accepted for *Transactions* during the year. The treasurer's report showed total receipts for 1925 to be $202,314.61, of which $62,931.25 were magazine receipts and $95,046.07 were current dues. Sales of *Transactions* netted $6,080.33. Expenditures during the year were $193,520.95, of which $59,742.75 were magazine expenditures.

Elections of officers for the ensuing year were announced as follows: S. A. Taylor, president; B. O. Mahaffey and Carl A. Meissner, vice-presidents; L. K. Armstrong, W. Spencer Hutchinson, and H. A. Guess were elected directors; and Seeley W. Mudd and Reno H. Sales were re-elected directors. Mr. Taylor, the president-elect, thanked the Institute for the honor bestowed upon him and said that he hoped to follow in the footsteps of Mr. Reynders. He said that the fall meeting, to be held in Pittsburgh, would be instructive and he wanted all to come.

B. F. Tillson introduced a resolution proposing that in the future the nominating committee submit to the members a ticket containing at least two names for each office to be filled. This effort on Mr. Tillson's part was wasted, as the resolution was voted down.

E. P. Mathewson Conducts Session on Non-Ferrous Metallurgy

Only one session was devoted to non-ferrous metallurgy, this being conducted by E. P. Mathewson, on Monday morning. The first paper was that by Horace Tharp Mann on the "Effect of Zinc Oxide on the Formation Temperatures of Some Ferrous Slags." This was read in condensed form by Carle R. Hayward, who pointed out the value of the experimental work which had been conducted in the laboratories of the Massachusetts Institute of Technology. He emphasized the higher temperatures at which lead furnaces were now being run, owing to the improved apparatus for taking care of the fumes, which higher temperatures permitted higher zinc in the slags. In the discussion of this paper, G. E. Dalbey related some of his experiences in running a small circular furnace on brass ashes high in zinc. H. D. Hibbert asked about the slags mentioned in the paper that contained only iron, lime, and zinc oxides without silica. Professor Hayward said that these were either zincates or ferrates. E. P. Mathewson then spoke briefly of early practice in Colorado and Burma; he pointed out that the secret of success in running high zinc slags was to have no sulphur present, as zinc sulphide makes a slag pasty. Later he added that in Burma practice lead amounted to about 3 per cent in the slag; this could have been lowered by adding sulphur to the charge but the metallurgists preferred to have a high lead loss rather than to have a pasty slag. C. S. Witherell spoke on the effect of various constituents in type slags. A. L. Walker mentioned the fact that in the slags given in Dr. Mann's paper, high zinc and high lead seemed to exist together and he wondered to what extent lead was considered. Professor Hayward replied that the paper was based on artificially prepared slags and that the effect of lead was not considered. To do so would have been to complicate the findings unduly.

G. D. Van Arsdale's paper on "Leaching Mixed Copper Ores With Ferric Sulfate; Inspiration Copper Co.," though printed, was read by title only, and there was no discussion.

Use of Ammonium Nitrate Discussed

E. F. Kern read in condensed form the paper on "The Conductivity of Electrolytes Used in the Electrolytic Separation of Silver and Gold," by F. F. Colcord, E. F. Kern, and J. J. Mulligan. The feature of this paper was the description of the use of ammonium nitrate, a reagent which increases the conductivity and results in more compact and finer silver crystals when the concentration of silver and copper is low. In the discussion, F. R. Pyne told of using sodium nitrate to increase conductivity; the addition of nitrates he thought probably depressed the dissociation of silver and gave a more matted product. He termed the paper an exceedingly valuable contribution. Professor Kern said that he had tried potassium nitrate several years ago, and found that it gave finer crystallization and a denser product. The silver would come off the cathode plates easily if they were coated with paraffin. Mr. Pyne then mentioned that he had added sulphuric acid to the electrolyte but that the precipitate had to be chiseled off. S. Skowronski affirmed that the effects noted were due to free nitric acid, and thought that the kind of deposit was more important than the increased conductivity, which latter factor could have little effect on the economy of operation. Further con-

tributions to the discussion were made by H. H. Alexander, E. E. Dieffenbach, E. L. Jorgensen, and M. H. Merriss.

W. A. Mueller read abstracts of the paper on "Treatment of the Telluride-bearing Gold Ores of the Wright-Hargreaves Mines, Ltd." At this plant, tellurides are removed by flotation and the concentrates treated with bromocyanide. Most of the discussion had to do with the advisability of bedding ores for cyanide treatment when the mill feed is subject to such great variations in precious-metal content as occur at the Wright-Hargreaves. That plant, Professor Mueller said, was too small to warrant bedding, though it was done to a certain extent at larger plants, such as the Hollinger. E. P. Mathewson thought perhaps the cyanide people had underestimated the importance of this subject, to which the copper hydrometallurgists had given so much attention. Professor Walker mentioned that the Golden Cycle, in Colorado, had rather an elaborate bedding plant.

The last paper to be presented was that of M. H. Merriss, on "Improvements in the Series System of Electrolytic Copper Refining Recently Developed by the Nichols Copper Co." A brief discussion was read by the author, being a few notes on the early history of the Baltimore plant, supplied by W. H. Peirce. The discussion also brought out the fact that the higher losses of gold and silver in the series system, compared with the multiple system, were largely due to the entanglement of slime containing the precious metals, in the lower part of the deposit on the long cathodes, these being 5 ft. long in the Nichols refinery. Mr. Merriss suggested that when the impurities were high, shorter and broader electrodes might be used. Such plates were used in the series refinery recently designed for the Boleo company in Lower California, but not on account of high silver content. Professor Walker showed that the advantages of low original cost in the tank room, owing to the economical use of floor area, was offset by the higher precious-metal losses. In his experience, the silver in the lower part of the cathode was much higher than in the upper part, a conclusion that Mr. Merriss had not tested. He commended the improvements that had been made by the Nichols operators, in increasing the percentage of permissible impurities in the copper anodes, but stated that the silver loss would always be comparatively high. E. L. Jorgensen asked if the cathodes were any thicker at the bottom than at the top, a characteristic that Mr. Merriss said he had not observed. It is also obviously impossible in the series system, where the anode and the cathode is the same piece of metal, to have the cathodes project from half to an inch below the anode, as Professor Walker explained was the common practice in the multiple system. Mr. Skowronski opined that the power economy of the series system would be offset in a measure by the difference in spacing of the electrodes to take care of impurities. Professor Kern replied that the big feature in power economy was the entire absence of contact losses in the tanks.

The Geology Session

One of the most interesting of the technical sessions at the Institute meeting was that devoted to mining geology on Monday afternoon, Chairman E. F. Burchard calling for the first paper about 2 o'clock, and the animated discussion not winding up till nearly 6. The paper of most controversial nature was that of Waldemar Lindgren on "Magmas, Dikes, Veins, and Contact Metamorphism." This has not yet been printed so Professor Lindgren read the portions of it that he considered of most interest. The paper is a critical

M. H. Merriss

review of the theories advanced by J. E. Spurr in his book "The Ore Magmas" and other publications. Professor Lindgren referred to the "so-called magmatic clan," and explained that the veindike theories of ore deposition did not belong to any one man, but were subscribed to by a group. His paper was an effort to show wherein he agreed and wherein he disagreed with these theories, and offered much food for discussion. J. T. Singewald, Jr., suggested that the inclusion of fragments of country rock was easily explained by Spurr's theory and inquired what other explanation Lindgren had to offer. This part of his paper, said Professor Lindgren, had not been read, but he had "quite a chapter" on that subject. In a word, he held that such fragments were not always really entirely separate from the country rock, though appearing so, and also that the incoming vein filling would shake down fragments of the wall rock into the partly filled vein. W. H. Emmons referred to the sandstone inclusions near the sidewalls of the gilsonite veins in the Black Dragon mine, and was inclined to support the arguments of Lindgren. After brief remarks by J. C. Anderson and J. F. Kemp, R. J. Colony pointed out the intimate connection between quartz dikes and veins and the pegmatites, and A. M. Bateman held that veindikes could not be brought forward to account for all phases of ore deposition. The time getting short, L. C. Graton suggested a further reading of the paper, and discussion, after the other papers had been presented, which was arranged. He remarked that when Mr. Spurr first published his theories he suggested that at least eight years would be required before they would be accepted, and he was not inclined to question them until that time was up. However, he admitted that he agreed largely with Professor Lindgren, except as to his conception of the rôle of colloids in ore deposition. In reply, Professor Lindgren said that he had no colloid theory; he then read the paragraphs of his paper concerned with the zonal theory, bringing out the importance of temperature, pressure, time, concentration, and other conditions, whereas he affirmed that Spurr's theory considered that temperature was the only important factor. He considered that the lower limit of ore deposition, which Spurr had held to be around 365 deg. C., was altogether too high, and that 100 to 150 deg. was more in line with the evidence.

Continuing the discussion later in the afternoon, W. H. Emmons explained, with the aid of lantern slides, his theories of the zonal deposition of orebodies. This zonal deposition, he showed, occurred around the cupolas of batholiths, the various metals being deposited, generally speaking, in concentric areas at various depths around the sides of such batholiths, gold being the deepest. He argued that aqueous solutions were likely to have deposited the minerals, and that practically all ores are features of the roofs of batholiths. The various zones of deposition he characterized as follows: (1) Cryptobatholithic; (2) acrobatholithic; (3) epibatholithic; (4) embatholithic; (5) endobatholithic; and (6) hypobatholithic. Most of the gold deposits were in the endobatholithic zone, according to Mr. Emmons. In concluding the discussion, Professor Graton said that he thought Mr. Spurr had underestimated the value of microscopic work and had fallen into errors by considering only broad field generalizations.

Altogether, it seemed rather a field day for the anti-veindike clan.

Two of the papers which had been printed were neither read nor discussed. These were "Geology of the Yoquivo, Chihuahua, Mining District," by C. W. Hall, and "The Geology and Ore Deposits of the Asientos Tepezala District, Aguascalientes, Mexico," by G. E. Anderson. An abstract of the paper by Paul Billingsley on the "Geology of the Zaruma Gold District of Ecuador," was read by Professor Colony, but there was no discussion.

The paper on "Lead and Zinc in Eastern Canada" by Frederick J. Alcock, was read in abstract form by A. W. G. Wilson, and illustrated with slides. This was published in the February issue of *Mining and Metallurgy*. Asked as to the economic possibilities of the deposits, Dr. Wilson replied that so far only two mines had produced important tonnages of ore, the Galetta mine, which had been in operation continuously since 1911, with a gradually increasing output, and the Notre Dame des Anges, in Quebec, which had produced irregularly, last year turning out about 6,500 tons of 45 per cent ore. In response to a question put by W. F. Boericke, Dr. Wilson said that he thought the deposits were similar to those of the Adirondack region in New York.

The paper on "Electrical and Electromagnetic Prospecting," by Hans Lund-

berg, was read in condensed form by the author. The chairman asked how feasible the Lundberg method would be in a wild region overgrown with timber such as that just described by Dr. Wilson, and Mr. Lundberg replied that it all depended upon whether the ore minerals had the right characteristics compared with the surrounding earth so that readings could be obtained. It had been successful in Scandinavia, he said, including the Onaberg district, in Sweden. Professor Bateman asked as to the depth at which the ore could lie and still obtain readings. This, Mr. Lundberg said, depended on conditions, but in the work so far done a depth of about 300 ft. had been about the lower limit. A query of E. E. Ellis brought the information that the orebodies might be discontinuous and still be susceptible of estimation by electrical methods. In soft iron ores of the Lake Superior type, however, more difficulties were encountered, and further laboratory work would have to be done on such deposits. B. F. Tillson spoke favorably of the process and of the work that Mr. Lundberg had done in which he had been concerned. A. H. Rogers said that the method was particularly valuable in finding the most favorable points for prospecting. Experience was required in the use of the instruments, however, to interpret properly the results.

A comprehensive paper on "Ore Deposition and Enrichment at the Magma Mine, Superior, Arizona," by M. N. Short and I. A. Ettlinger, was read in condensed form by the last-named. In the brief discussion that followed this paper, Professor Graton questioned the origin of the deep-seated chalcocite, which he did not believe was hypogene, though J. C. Anderson did not agree with him here. Finally Professor Lindgren commended the paper as of unusual excellence.

Much Work Ahead for Committee on Mine Ventilation

The reports from various subcommittees featured the sessions of the committee on mine ventilation. These were preceded by an illustrated lecture on the New York-New Jersey Vehicular Tunnel by Ole Singstad, chief engineer for the commission, and a description of the work done at the U. S. Bureau of Mines experimental mine, at Pittsburgh, in preparation for the design of the ventilating system for the tunnel. The removal of the exhaust gases from the motor vehicles forms one of the biggest ventilation problems ever undertaken.

Dr. R. R. Sayers, chief surgeon of the U. S. Bureau of Mines, reported on behalf of the Subcommittee on Physiological Studies and outlined the activities planned in connection with the investigation of toxic and noxious gases, the permissible limits of such gases in mine air, and the treatment of persons affected.

Prof. A. C. Callen, of the department of mining engineering at the University of Illinois, reported for the Subcommittee on the Physics of Ventilation. He and others questioned the reliability of measurements of pressures and velocities, the pitot tube for example coming in for condemnation. G. E. McElroy defended the tube when used properly, and B. F. Tillson advocated the use of orifices to measure air flow. A proposal on the part of the British Institution of Mining Engineers to adopt a new and simpler formula for ventilation calculations, and standardization of constants, did not meet with great favor. Particularly in metal mines, the factors are subject to too much variation to permit of simplification. Apparently there is much room for advance in elucidating the physics of ventilation.

The report of Frank Haas for the Subcommittee on Coal Mine Ventilation aroused some spirited discussion on the use of booster and auxiliary fans. E. A. Holbrook and others expressed their views. No conclusion was reached even as to the advisability of making recommendations on this point.

Metal Mining Companies Should Anticipate Legislation

B. B. Gottsberger had no formal report to make for the Subcommittee on Metal Mine Ventilation. He suggested that metal mining companies should anticipate any possible legislation regarding ventilation rather than find themselves in a position where they might have to oppose it.

G. E. McElroy's brief paper on metal-mine ventilation gave an excellent résumé of progress in the last ten years. He showed how the opening of deeper workings and the change in mining methods had made ventilation a problem of constantly increasing importance, and how good ventilation, by mitigating the difficulties arising from heat, humidity, and dust, had in many instances increased the efficiency of the workers by as much as 100 per cent.

Other papers included one on "Mine Fan Characteristics," by L. W. Huber, of Carnegie Institute; and one entitled "Theoretical Rating as Compared With Operating Performance of Mine Fans," by A. S. Richardson, ventilation engineer for the Anaconda Copper Mining Co. This paper was a particularly valuable contribution because of its practical value.

Petroleum Sessions Well Attended

Of all topics on the program, petroleum received the most attention, a half dozen sessions being devoted to its consideration. Over fifty papers were presented, interspersed with frequent discussion. Space does not permit mention all of these papers, even by title. Some of the more important will be referred to briefly. E. L. De Golyer, president of the Amerada Petroleum Corporation, gave figures on the petroleum production of the world at the opening session. For the third successive year it had passed the billion barrel mark, he said. A new peak was established with a production estimated at 1,066,208,894 bbl., an increase of 5.2 per cent over the amount produced in 1924, and 4.6 per cent over the output in 1923, the previous peak year. Production in the United States increased approximately 50,000,000 bbl. to a new peak, the output being estimated at 764,000,000 bbl. Venezuelan production increased some 11,000,000 bbl., and Russia, Rumania, Persia, Argentina, and Peru showed substantial and satisfactory increases. Mexican production decreased about 25,000,000 bbl.

Production of foreign countries during 1925, said Mr. De Goyler, was generally according to expectations presented at this time last year. Production in the United States had exceeded expectations, and consumption, satisfactory as it had been, had been less than anticipated. The net result had been an increase in stocks instead of the indicated draught. On the whole, however, he said, overproduction had been confined fairly well to low-gravity Smackover crude, in the eastern United States, and to California, and the year had been a prosperous and satisfactory one in the industry—by far the best that it had experienced since 1920.

The outlook, Mr. De Golyer said, for the present was the same as the outlook at this time in 1925 and in 1924—namely, for a decline in production and for withdrawal of oil from storage. As in previous years, no pool of bonanza proportions was in sight. Our expectations had failed of realization before, he said, and might fail again.

F. G. Clapp, who has recently returned from Australasia, was called upon by the chairman, F. Julius Fosh, for comment. He said that of the Australian states, Western Australia, South Australia, Victoria, Tasmania, and Northern Territories had no oil—that the outlook for it in those states was hopeless. Joseph E. Pogue said that in the last three years the trend of production of the world and of the United States was at a different gradient from the years preceding and that in this country it was now difficult to forecast the output many months ahead.

Taxation in the Oil Industry

A paper that attracted considerable attention was one on "Taxation and the Oil Industry," by Albert D. Brokaw, consulting geologist, of New York. It had often been pointed out, said Mr. Brokaw, that certain railroads and other public utilities paid more in taxes than in dividends. Many oil companies, he said, could point to a comparable situation. He would confine his discussion, he said, to taxes that were more or less specifically taxes on the oil industry and similar industries. While our attention had been fixed on the matter of federal taxes, state and local taxing bodies had not been idle. As a result he believed, Mr. Brokaw said, that the burdens of state and local taxation on industry in general and on the oil industry in particular were much heavier than the burden of federal taxes. Since 1918 federal tax laws had recognized some of the difficulties besetting the oil and mining industries by making provisions which were intended to equalize matters and bring them on a par with industries less subject to violent fluctuations. The state and local taxing bodies, however, appeared to have singled these industries out for special attack. Taxes levied specifically against a group of industries usually took the form of so-called severance taxes, though they might be

designated gross-receipts taxes, or occupational, or production taxes. They were simply taxes levied on the output, usually a percentage of gross market value, but in a few cases they were imposed at a flat rate per unit of output and in others at a percentage of the net value per unit, net value in this case meaning gross value less certain specified deductions, but not the real net value to the producer. In most of the states in which the production tax was imposed, it was in addition to *ad valorem* taxes, he said, and the result was, of course, discriminatory. He cited from the report of the Minnesota Tax Commission the statement that in recent years there had been a growing tendency toward special taxation of natural resources, due in part, no doubt, to a widely prevailing opinion that the state should exact a relatively greater tribute from natural than from created wealth. Mr. Brokaw said that he thought that everyone who had ever drilled a successful wildcat well would maintain that the wealth arising from it was not entirely natural wealth, but that he had had some part in creating it. No sharp distinction might be drawn between natural and created wealth, he said. The argument that such taxes were not double taxation, because one taxes property accumulated under the law, and the other the privilege of taking our economic wealth and later the privilege of drawing on the state's economic wealth, which was measured by the value and volume of the severed mineral, was set forth in the Thirteenth Annual Report of the Tax Commissioner of Texas. This argument ignored the fact, he said, that the state had in most cases divorced itself of that economic wealth for a stated consideration and was reasserting by legislative enactment an ownership of which it had previously divested itself.

Facts on Core Drilling to Correlate Strata

Another interesting paper was "Structure Investigation by Diamond Core Drills," by R. D. Longyear and P. W. Donovan. This form of investigation, said Mr. Donovan, who read the paper, had become of increasing importance, until now approximately fifty diamond drills were in operation in various parts of North America, working solely on the problem of furnishing structural data where surface exposures were absent or inconclusive. Most of these drills at present were in northern Oklahoma and southern Kansas, although Texas and the Rocky Mountain region had seen a fair share of diamond core drilling. Drilling was usually carried out in regular pattern, holes being located at every section corner or every other section corner, though shorter intervals were sometimes necessary for close work. Sometimes several drills would be placed on one block of leases to get desired information quickly. Drilling was carried to whatever depth was necessary to form a basis for reasonably accurate correlation. In most districts this meant holes less than 600 ft. deep.

The requisites of a drilling outfit to handle the work properly, according to Messrs. Longyear and Donovan, were: (1) ability to take an accurate sample; (2) ability to drill rapidly and economically; and (3) portability. The first meant a diamond drill. For general work no satisfactory substitute had been found. A 2-in. core, generally known as size "N," was the universal practice. A ball-bearing double-tube core barrel was standard practice. The carbon was set with generous clearance, and deep waterways were cut in the bit because a thick mud circulating fluid was essential in preventing cave. A high percentage of core recovery was usually obtained. The second and third requisites were obtained by using a gasoline-driven drill mounted on a steel truck. The pump was 4x6-in. or 3½x5-in. duplex pump, usually amounted on the same truck with the drill and gas engine. Moving was done with teams or a tractor.

Core Drilling Procedure

In drilling the first hole on a given block of leases it was customary to use the diamond core bit for the entire distance. If the upper part of the hole was shale containing no beds which could be correlated, the drilling could be started with a fish-tail bit, which would give greater progress and lower costs in soft shales. Lately it had become general practice to dress the face of the fish-tail bits with stellite. Little casing was used, according to Mr. Donovan. It was customary to start the hole with a 2⅞-in. fish-tail bit, which drills the same size hole as the "N" diamond bit. If the formation tended to cave, the upper part of the hole was drilled with a 4¼-in. fish-tail bit and cased with 3-in. pipe. Reaming was done with a 4¼-in. fish-tail bit, though hard beds were sometimes reamed with a roller bit. Work was carried on in two twelve-hour shifts with one driller and one helper on each shift. The diamond setter would set bits for two or three drills, and, if he had a competent helper, could keep his own drill running while setting. A geologist was usually in charge of each drill or group of drills, if located close together, who also acted as a "tool pusher." A diamond-setter driller received wages of about $11 to $12 per twelve-hour shift, the driller $8 to $10, and the helper about $6.

The cost of a portable gasoline-driven drilling outfit, including pump and drill rods or drilling stem for holes 500 ft. deep, and carbon, was approximately $7,000 to $10,000, depending upon the amount of accessory equipment. One diamond bit was usually sufficient for each drill. A monthly drilling progress ranged between 700 ft. and 2,500 ft. per drill, depending upon local conditions. In general, 1,500 to 2,00 ft. per drill per month might be considered good progress. The cost per foot varied from $1.50 to $3.

Mining Methods—Scrapers and Drill Sharpening Discussed

Details of operation and costs of mining were given in a paper entitled "Top Slicing in Old Fills at El Bordo Mine, Mexico," by R. J. Mechin. The "ore" body, which dips about 85 deg. and averages 23.9 ft. in thickness, consists of old fill, partly caved ground and solid rock, all of which are mined together at a cost of $0.78 per ton. Slices are 12 ft. thick. This paper and one on "Mining Methods in Grass Valley District," written by J. A. Fulton and A. B. Foote and presented by W. S. Palmer evoked interesting discussion of the use of scrapers instead of hand shovels and wheelbarrows. Mr. Mechin said that with the prevailing wage scales scraping at El Bordo had not proved economical, especially because of the difficulties encountered in handling drag cables where timber was present.

W. F. Boericke remarked that the only particular change in the present Grass Valley methods was the use of scrapers instead of hand shovels that were in vogue twenty years ago, when he got his first job in the North Star mine, at Grass Valley. George O. Packard said that light scrapers about 3 ft. by 10 in. were used. The trouble with heavier ones was that sorting of waste was neglected when a scraper of larger capacity was employed. F. W. Sperr described the use of scrapers in the Michigan copper mines. He believes that many of the orebodies now being mined would be unprofitable except for the use of scrapers. In many instances he said two men did the work formerly accomplished by fifty shovelers. He told of another case where scrapers had made it possible to do away with expensive maintenance and timbering in an iron mine. He stressed the importance of speed in removing the ore in a given locality if costs were to be low.

The importance of careful control of temperatures in tempering drill steel was stressed in a paper by C. M. Haight on the practice at the Franklin mines of the New Jersey Zinc Co. Pyrometric control for limiting the temperature for forging to 1900 deg. F. and for tempering to 1450 deg. is provided. The Gilman automatic heat-treating machine is used and gives satisfaction. G. H. Gilman in discussing the paper traced the development of the "hand-and-eye" method and the old slack tub to the present carefully controlled operations of modern shops. He gave the opinion that the installation of heat-treating equipment was warranted wherever more than 300 pieces of steel were to be sharpened each day.

Banquet a Success

The annual banquet was held at the Waldorf-Astoria on Wednesday evening at the close of the technical sessions. As usual it was a brilliant affair, thanks largely to the ladies present. Wilbur Nelson, one-time state geologist of Tennessee and now state geologist of Virginia, made an excellent toastmaster. Short addresses were delivered by Mr. Taylor and Mr. Reynders. Presentation of the J. E. Johnson, Jr. award, was made. It was received by S. P. Kinney for his work on blast furnaces. Charles L. Kinney received the Robert W. Hunt medal. The James Douglas medal went to James M. Callow, of Salt Lake City.

On Thursday a visit was paid to Bear Mountain bridge, which was built under the supervision of Mr. Reynders. Earlier in the week the new vehicular tunnel under the Hudson was inspected by the members.

Men You Should Know About

There is an opening on the editorial staff of *Coal Age*. Please address J. E. Spurr, *Coal Age*, 10th Ave. and 36th St., New York, giving such information as would be of interest.

A. Homer Black, mining engineer of Tonopah, Nev., is in San Francisco on business.

Walter A. Schmidt, president of the Western Precipitation Co., of Los Angeles, is in Arizona on a business trip.

W. H. Blackburn has returned to Tybo, Nev., from San Francisco, and will start development work on the property.

J. Edgar Pew was recently elected president of the Beacon-Sun Oil Co. Mr. Pew is vice-president of the Sun Oil Co. and in charge of production.

Jay A. Carpenter, mining engineer of Los Angeles, has been appointed professor of mining at the Mackay School of Mines, University of Nevada, Reno, Nevada.

L. V. Emanuel, superintendent of the River Smelting & Refining Co., Florence, Colo., is in New York for three weeks, staying at the Columbia University Club.

Walter S. Palmer, professor of metallurgy of the Mackay School of Mines, University of Nevada, has been given a three-months' leave of absence in which to visit mining schools.

A. J. McDonald, of Montreal, president of the Don Rouyn Gold Mines, operating in Rouyn Township, northwestern Quebec, recently made an inspection of the property.

E. M. Norris, group superintendent of the Anaconda Copper Mining Co., at Butte, is in New York City, representing the Montana Section at the annual meeting of the A. I. M. E.

C. T. Eastman, manager for the Mono Mining Co., of Nevada, at its Silverado mine, near Sweetwater, has returned to the mine from a business trip to Chicago and other eastern points.

F. W. Maclennan, general manager of the Miami Copper Co., and Mrs. Maclennan have left Miami on a four months' vacation trip to Europe and the countries bordering the Mediterranean Sea.

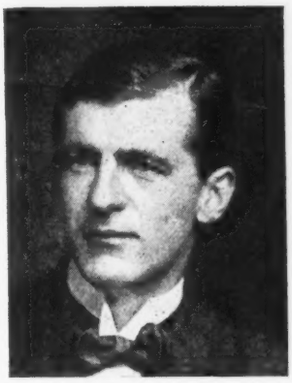
A. J. McNab and **Howard Poillon**, president and consulting engineer, respectively, of the Mason Valley Mines Co., have been in Nevada inspecting the company's mine and smelter at Mason and Wabuska.

Ira B. Joralemon, mining engineer and geologist, of San Francisco, is in Ely, Nev., in connection with a right-of-way suit between the Nevada Consolidated and the Consolidated Copper Mines Corporation.

Fletcher Wood, manager of the Florence Goldfield Mining Co., at Goldfield, Nev., is making an examination of the Williams silver-lead mine near Mackay, Idaho, recently taken under option by Kirby Thomas for New York interests.

W. J. Perkins has resigned as superintendent of the Judson mine, Alpha, Mich., operated by Pickands, Mather & Co., and his place has been taken by **Harold Shieber**, formerly chief engineer at the company's Penn mines, at Vulcan, Mich.

Walter A. Sheek, construction engineer of the Western Precipitation Co., left Los Angeles on Feb. 3 to start the construction of an electrical precipitation unit at the plant of the Knickerbocker Portland Cement Co. at Hudson, N. Y.



Dr. J. Mackintosh Bell

Dr. J. Mackintosh Bell, managing director of the Vipond mine, in the Porcupine district of northern Ontario, has sailed for London and will return early in the Spring.

James Aston, director of research for A. M. Byer & Co., manufacturers of wrought-iron pipe, Pittsburgh, Pa., has been appointed head of the department of mining and metallurgy, Carnegie Institute of Technology, Pittsburgh. He succeeds **F. F. McIntosh**, who resigned to join the staff of the Crucible Steel Co. of America, with his headquarters at Pittsburgh.

J. B. Tyrrell, managing director of the Kirkland Lake mine, in the Kirkland Lake district of northern Ontario, has returned from a business trip to England. He reports that he found a decided apathy toward Canadian mining ventures in the financial district of London, the obvious reason being that London was overrun with stock promoters and many of the British people had been made skeptical and suspicious because of the loss of former investments.

E. J. J. Rodda, who had been general manager of the Mount Isa Proprietary Co., Queensland, Australia, since its formation, has left the Mount Isa field and returned to Sydney, New South Wales, the first-named company having been merged with the Mount Isa Mines, Ltd. **W. H. Corbould**, managing director of the Mount Isa Mines, Ltd., Queensland, Australia, is now personally supervising the operations of that company on the Mount Isa field.

William Anderson Staab has been appointed assistant professor of mining engineering at West Virginia University to fill the vacancy caused by the resignation of **Thomas Fraser**. Mr. Staab is a graduate of Lehigh University, class of 1910. Since being graduated he has spent ten years in mining engineering work at Morenci, Ariz., one year teaching at Lehigh University, and for the last four years has been a mining engineer for the Lehigh Coal & Navigation Co. at Lansford, Pa.

George E. Lynch, consulting engineer of Los Angeles, specializing in dust control, recently returned from the Northwest, where dust systems were designed for the Allenby Copper Co., Ltd., Allenby, B. C., and for the Superior Portland Cement Co. at Concrete, Wash. He is now completing designs for dust control at the plant of the Granite Rock Co. at Watsonville, Calif., after which he will proceed to Arizona to test and adjust similar systems now being installed at the plants of the Old Dominion Copper Co. at Globe and the United Verde Copper Co. at Clarkdale.

W. F. Staunton, vice-president and general manager of the Verde Central mine at Jerome, Ariz., has tendered his resignation to the board of directors of the company. His successor will be **R. H. Dickson**, who has been superintendent of the 85 Mine, at Valedon, N. M. Both the Verde Central and the 85 properties are owned by the Calumet & Arizona Mining Co. As a token of their appreciation of the magnificent work done by Mr. Staunton during the six years he was connected with the Verde Central Mines Co., the employees, led by E. L. Bartholomew, superintendent, recently presented him with a beautiful copper loving cup. Mr. Staunton after a short rest will devote his time and efforts to the development of another promising copper property.

Obituary

James Shepard, historian and geologist, died at New Britain, Conn., on Feb. 15. He was eighty-eight years old and was one of New Britain's best known citizens. During the latter years of his life he devoted a great deal of time to historical research and the data he compiled appeared in several of his books.

James Higbie Polhemus, manager of mines for the New Jersey Zinc Co., died at his home in Upper Montclair, N. J., on Feb. 10. Mr. Polhemus was born at East Orange, N. J., on Jan. 28, 1884. He was graduated from the Massachusetts Institute of Technology in 1906 with the degree of mining engineer, and immediately entered his life work. He was manager of mines for the American Lead, Zinc & Smelting Co. before accepting employment with the New Jersey Zinc Co. Mr. Polhemus was a member of the American Institute of Mining Engineers, the Mining and Metallurgical Society of America, the American Mining Congress, and the Holland Society of New York. He is survived by his widow and four children.

Recent Technical Publications

Reviews, Abstracts, and References

Economic Truths, Palatably Served

Profits. By W. T. Foster and Wadill Catchings. Published by the Pollak Foundation for Economic Research. Newton, Mass. Price $4.

If we had any influence in labor circles, we would see to it that this book had wide distribution among those who work for daily wages, because it brings out many thoughts that the ordinary text on economics fails to stress—thoughts that are of considerable interest to the laboring man, whether he wear a white collar or a red flannel shirt. In this connection, and as one of their main contentions, the authors state that it is useless for industry to produce anything unless consumers are given the money with which to buy the products of industry. Otherwise, the authors claim, we have those vicious business cycles so disturbing to every element of business and society. In other words, high wages and salaries, and large dividends tend to sustain industry; low wages, low salaries, and the passing of dividends, the opposite. Prosperity begets prosperity. This is not exactly a new thought, but the manner in which the authors have developed it is. One of the objects of business, therefore, would seem to be the payment of as high wages and dividends as possible.

Another thought which the authors give is that thrift can be pursued to an undesirable limit, not only by individuals but also by savings banks and corporations. There is a time for thrift, and a time when spending is to be preferred. By retaining surplus funds in their treasury to be used ultimately in expanding plant and production, corporations hasten the downward turn of the business cycle, so the authors infer. Saving is desirable, nevertheless, but saving helps to bring about business depressions. The "dilemma of thrift" the authors term it.

To this reviewer it would seem that there is much truth to the arguments of Messrs. Foster and Catchings. Their only limitation is that they are developed chiefly from conditions as they exist in the United States. Is there not an international phase to be considered, and is not the international phase so important that it is the controlling element in any solution of the economic problem which the authors outline?

Messrs. Foster and Catchings seem to be doing for the science of economics what Spurr is doing for geology, Robinson for psychology, and Fosdick for religion; that is, testing the subject here and there, brushing away the theories and practice that cannot stand the application of common sense and careful reasoning. Though the authors advance no solutions of the economic problem described, they have contributed some extraordinarily clear thinking to the subject. Even if they have only established a few economic truths, their work will be highly fruitful. The book is written in a simple, forceful style that many textbooks could copy with advantage.

Incidentally, a prize of $5,000 is offered for the best adverse criticism of the book. F. E. WORMSER.

Mineral Resources — A bulletin on "Silver, Copper, Lead, and Zinc in the Central States in 1924," 30 pages, by J. P. Dunlop and F. Begeman, has been issued by the U. S. Bureau of Mines in the "Mineral Resources" series. Copies are obtainable for 5c. each from the Superintendent of Documents, Washington, D. C.

Wyoming Platinum—U. S. Geological Survey Bulletin 780-C, eight pages, is by Frank L. Hess, and discusses "Platinum Near Centennial, Wyoming." "Platinum metals, in very small quantities, are undoubtedly present on Centennial Ridge," says Mr. Hess, "but the chances for such discoveries are too few to warrant the expenditure of money, time, or labor." The bulletin is obtainable on request to the U. S. Geological Survey, Washington, D. C.

Fireclay—U. S. Government specifications for fireclay are given in Circular No. 298 of the U. S. Bureau of Standards, six pages, obtainable for 5c. from the Superintendent of Documents, Washington, D. C.

Standard Samples—U. S. Bureau of Standards has a large number of standard samples of ores and metals, which have been carefully analyzed and which can be supplied to chemists and others, with analyses, for a small fee. Supplement to Circular No. 25 of the Bureau gives a list of these samples and a summary of the analyses. Such samples are useful for checking methods and reagents. Copies of the circular are obtainable on request to the U. S. Bureau of Standards, Washington, D. C.

Prospectors' Mineralogy — The University of Arizona has issued a fourth edition of Bulletin No. 121, by George R. Fansett, on "Field Tests for the Common Metals," 37 pages. This should be a valuable book for field men who are not always able to send samples to a laboratory for even a qualitative estimation of the minerals or metals present. Elaborate chemical equipment is not required, many of the suggested tests being made by the blowpipe, brief directions for the use of which are given. Copies of the booklet may be obtained on request to the Arizona Bureau of Mines, Tucson, Ariz.

British Mines—A list of mines in Great Britain and the Isle of Man, giving the name and address of the owner, the name and situation of the mine, the name of the manager and assistant manager, and the number of persons employed, covering the year 1924, has been issued by the Mines Department (422 pages). It is obtainable for 18s. 6d. from the British Library of Information, 44 Whitehall St., New York City.

Wisconsin—"A Brief Outline of the Geology, Physical Geography, Geography, and Industries of Wisconsin," by W. O. Hotchkiss and E. F. Bean, has recently been published as Bulletin No. 67 of the Wisconsin Geological and Natural History Survey, Madison, Wis., obtainable on request. Other bulletins recently published include: No. 65, "The Geography of Southwestern Wisconsin," by W. O. Blanchard, and No. 66, "Limestones and Marls of Wisconsin," by Edward Steidtmann.

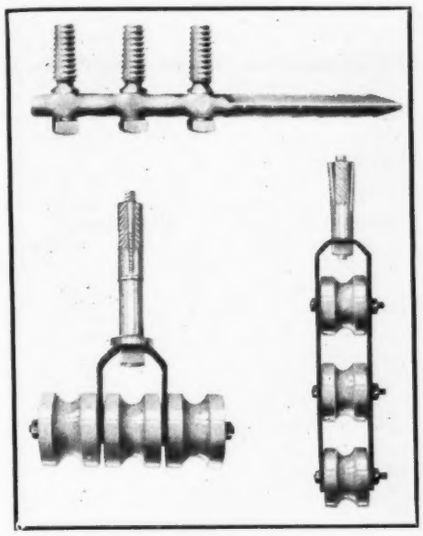
California Mining—"California Mineral Production for 1924" was recently issued as Bulletin 96, 174 pages, by the California State Mining Bureau, Ferry Building, San Francisco. Statistics of production and resources are given, but the names of producers are in general, omitted. The bulletin is obtainable on request.

Mine Timber Preservation — The *Journal* of the South African Institution of Engineers for January (Johannesburg; price 2s.) contains 10 pages devoted to a paper by J. J. R. Smythe entitled "Plant for Preservation of Mine Timber, Ferreira Deep, Limited," and ensuing discussion. Creosote was formerly used, but in 1922 a change was made to zinc sulphate solution. Three years later, an inspection showed that treated laggings in the mine for that length of time appeared to be as good as the day they were put in, whereas untreated laggings were rotting so rapidly that in a short time all trace of them would be lost. The treating plant was made out of second-hand materials, and its construction is described. Absorption of the solution is usually accomplished in fifteen or twenty minutes, at a pressure of 80 to 90 lb. Costs for the period June, 1925, to October, 1925, in which time 45,962 cu.ft. of timber were treated, using 4 per cent $ZnSO_4$ solution, amounted to £94 11s., these including labor, solution, and compressed air. This is equal to 0.49d. per cubic foot of timber. The absorption per cubic foot was 0.753 Imperial gallons.

Electrical Handbook—The "Mechanical World" Electrical Pocket Book for 1926 has recently been issued (401 pages). This is the nineteenth year of publication of this handy collection of electrical engineering notes, rules, tables, and data. It is obtainable for 1s. 6d. from Emmott & Co., Ltd., 65 King St., Manchester, England, the volume being cloth bound.

Estimating Dumps—"Some Methods of Estimating Quantities as Applied to Dams, Dumps, Etc.," is the title of a paper by F. T. Kerr, eight pages, in the *Proceedings* of the Australasian Institute of Mining and Metallurgy, for Sept. 30, 1925 (Melbourne). The methods described include traverses and levels, with transverse sections at irregular intervals; mean area; transverse sections at regular intervals; contour or horizontal section method; and three methods for very wet dams, long, low, and narrow dams with flat tops, and steep-sided or very irregular high dumps. Another short paper by A. B. Black in the same publication discusses the "Quantity Estimation of Concentrate in Dams."

New Machinery and Inventions



Handy suspensions for three-way circuits

Standard insulators are used exclusively and in every case all three are held in place from a single attachment. This greatly simplifies circuit suspension.

Simplified Suspensions for Three-wire Feeder Lines

Three schemes for suspending 3-phase feeder lines or combining other circuits onto one bracket are provided by new devices developed by the Ohio Brass Co. Each of these devices has three insulators or spools assembled so as to carry three wires with the use of only one expansion bolt or barbed pin.

In one, the right angle triple-pin type attachment can be made either in the roof or wall by means of the barbed pin. Thus either a horizontal or a vertical position of the insulators is secured. This fitting uses any standard 1-in. threaded insulator and, consequently, can be used where it is desired to take advantage of high tension porcelain insulators. All three are accessible and the device is said to be easy to erect.

The other devices are modifications of the clevis frame used with the O-B Type C single spool assembly, adapted to carry three spools. Attachment to the roof is made with an expansion bolt. In one, the spools are mounted one above another and in the other the three spools are carried side by side on a bolt extended through the clevis. In addition to use for 3-phase power feeder lines these fittings are being employed in combinations of phone lines, signal wires, feeder and other circuits, thus simplifying construction.

An Improved Shoveling Machine With Low Headroom

The new shoveling machine (No. 2-25) recently developed by the Myers-Whaley Co., Knoxville, Tenn., embodies several points of design that make the shovel different from those designs of shovel introduced earlier by the company. This machine is designed for operation in very low headroom. It is only 39 in. high over-all from the rail, and can be operated in headroom as low as 42 in. from the rail. It is a heavy, substantial machine, however, and embodies all improvements which the company has developed up to this time. A roller chain drive is used from the motor to the first shaft instead of a spur-gear drive. This drive is enclosed in oil casing and is noiseless, and the designers think that it will prove very durable. The first machine has been in service for loading rock a short time, and in that service has developed the same capacity as the company's Special No. 3 or Standard No. 3, and is said to have required no repair parts. Indications are that the upkeep on the machine will be low.

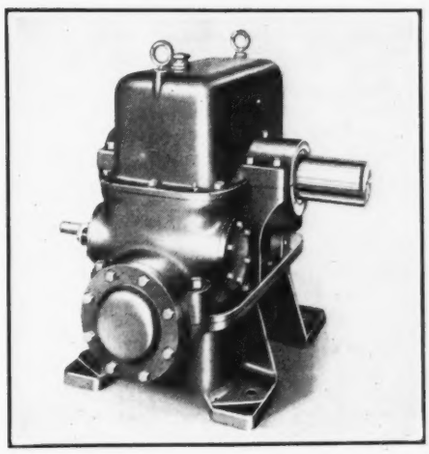
Another machine recently developed by the company is an auxiliary turntable conveyor which is used back of the shovel, for delivering material to the side. This conveyor swings 360 deg., and is adjustable in and out and up and down at the discharge end. Its extreme reach is 13 ft. to each side from the track center. This auxiliary conveyor is built with the same care as its other machines, the company says, and is applicable for loading of rock or ores where it is desired to load on parallel track or to discharge the material at considerable distance to one side of the track.

Two-step Worm Reduction Gear for Driving Conveyors and Stokers

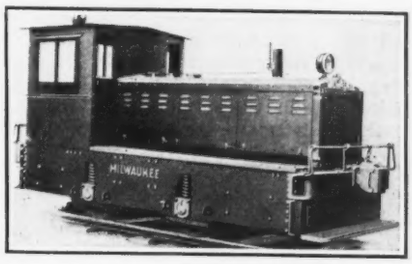
Recently the De Laval Steam Turbine Co., Trenton, N. J., has developed a two-step worm reduction gear to provide ratios of from 100 to 1 to 8,000 to 1. The unit which is shown in the accompanying cut is designed for driving conveyors, stokers, heat-treating furnaces, escalators or similar devices. Its gearing consists of an initial worm turning a wheel mounted on the end of an abutting shaft. This shaft carries a second worm which drives the low-speed wheel and shaft.

A single casing carries all bearings for the high-speed worm shaft and the low-speed worm shaft, which also carries the high-speed wheel and shaft so as to insure accurate alignment and meshing. The construction is rugged to enable the use of the unit for heavy-duty work. End thrust and bending strains from the driving and the driven machine are taken on flexible couplings of the pin and rubber bushing type.

The casing serves as an oil reservoir, in which oil is maintained at a sufficient level to touch the high-speed wheel and the low-speed worm at all times. In addition to this, the unit is equipped with a positive oil pump by means of which oil is drawn from the reservoir and forced through passages to the low-speed shaft bearings.



This new two-step worm reduction gear is intended for driving stokers, conveyors, heat-treating furnaces and other similar devices



New 18-ton gasoline locomotive

Two New Gasoline Locomotives of 18- and 20-Ton Capacities

The latest addition to the line of gasoline locomotives manufactured by the Milwaukee Locomotive Manufacturing Co. consists of two locomotives of 18 and 20 tons' capacity respectively. These machines are of the four-speed gear and chain drive type, and are geared for four speeds of 2, 4, 6, and 12 m.p.h. both forward and reverse. The machines are built for all gages of track from 30 to 56½ in., and the design of the frame is such that the center of gravity is very low, to steady the locomotives on poorly surfaced track.

It is claimed that the design of the transmission eliminates all possibility of stripping the gears, and as the gears are always in mesh there can be no clashing. All the gears have exceedingly wide faces and are made of chrome-nickel steel forgings, except the final driving gear and pinion, which are made of steel castings. Removal of the various covers and housings for inspection of the gears and the entire dismantling of the transmission without removing the case proper from the locomotive are features of the design. Driving sprockets on the final drive shaft in the transmission are centrally located between two bearings, thus providing a rigid and sturdy construction and eliminating the use of a separate jack shaft. Chrome-vanadium roller chains are employed for power transmission.

The locomotive is equipped with hand-operated four-wheel brakes as standard, but also can be equipped with straight or automatic air brakes when specified. A 12-volt electric lighting and starting system consisting of a generator starter and Westinghouse storage battery is used. The engine is a Beaver six-cylinder heavy-duty type, having overhead valves, forced feed oiling, and a maximum speed-regulating governor.

The Market Report

Metal Prices Sag in Dull Market

Copper, Lead, Zinc, and Silver All Lower Than a Week Ago—Tin and Lead Slightly Stronger Abroad

New York, Feb. 17, 1926—None of the non-ferrous metals have given a very good account of themselves in the week ending today. The unsettled stock market is held to be the principal reason, for business conditions continue excellent, and the settlement of the anthracite strike, the only important labor disaffection in the country, was certainly not a bearish factor. Foreign markets have fluctuated only a little, being slightly lower for copper, zinc, and silver, and were a little improved for lead and tin. The holiday on the 12th, Lincoln's Birthday, of course affected the total volume of sales for the week.

Copper Now 14¼c.

Sales have been in much less volume than a week ago, when an excellent business was done. In fact, producers have been so well sold up that there has been little temptation to cut prices, and practically all interests have quoted the market at 14⅜c., delivered Valley, and 14½c. Middle West, all week, being content to make only occasional sales at these levels. One or two interests which make it a practice to market their current intake regularly shaded prices a little, doing business in Connecticut as low as 14.30c. delivered; and yesterday and today, following the slight decline in London, offers of good tonnages have been made for either prompt or forward shipment, at 14¼c., without arousing any great enthusiasm among the purchasing agents. Even 14.20c. has been named for deliveries close to New York.

The brass companies report their business to be even better than last year. One of the largest companies, for example, reports a very substantial increase in January business over that for January, 1925, and two other companies report their unfilled orders as the highest in years. Wire and cable manufacturers are also active, so producers have grounds for their firm attitude regarding price in spite of a temporary lull in demand. Most of the metal sold has been for March and April shipment. A few resale lots of prompt copper have been absorbed in the f.a.s. market around 14.15c.

The foreign market was satisfactory until Saturday at least, with sales by American agents around 14.50@14.55c., c.i.f. Prices have since been advanced to 14.60c., but business has been slight, as dealers have quoted at concessions of from 10 to 20 points from this price.

Lead Price Concessions Scare Off Buyers

After holding at 9.25c. since Dec. 8, the American Smelting & Refining Co. reduced its contract price for New York lead to 9.15c. on Feb. 11. This move was not unexpected in view of the decline in the London market to less than the level at which foreign bullion lead could be imported profitably. The markets are now about on a parity in this respect, with a slight showing of strength the last few days in London. Buying has been adversely affected by the decline, as consumers feel that the trend is likely to continue downward. No marked movement in this direction is likely, however, until producers have more lead. Of course, there is little or no demand for February shipment, and some large consumers have provided themselves pretty well for March, but, on the other hand, some producers have very little to offer before April.

In the East, buyers have not had to pay much over 9.15c., no matter where they have been situated, though somewhat higher prices have been obtained for small shipments from Middle

Daily Prices of Metals

Feb.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
11	14.175	62.75	64.00	9.15	9.05@9.075	7.70
12	Holiday	.....	.....	.....	.....	.....
13	14.125	62.75	64.00	9.15	9.00@9.05	7.70
15	14.075	63.00	64.25	9.125@9.15	9.00	7.65
16	14.075	63.00	64.125	9.10 @9.15	9.00	7.575@7.60
17	14.025	63.125	64.25	9.10 @9.15	9.00	7.50 @7.55
Av.	14.095	62.925	64.125	9.138	9.018	7.633

*The prices correspond to the following quotations for copper delivered: Feb. 11th, 14.425c.; 12th (Holiday), 13th, 14.375c.; 15th and 16th, 14.325c.; 17th, 14.275c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Feb.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
11	60½	61½	67	287½	281	33½	33 11/16	35¾	35¾
12	60½	61½	67	286½	280⅛	34	34 1/16	35⅞	35⅞
15	60⅜	61⅜	67	288	281⅜	34 5/16	34 5/16	36 1/16	36 3/16
16	59⅞	60⅞	66½	287¾	280½	34	34	35 13/16	35 13/16
17	59¼	60¼	66½	288	280½	34 1/16	34 1/16	35 9/16	35⅝

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Feb.	Sterling Exchange "Checks"	Silver		Gold London	Feb.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
11	4.86	66⅞	30⅞	84s11½d	15	4.85⅞	66¾	30 13/16	84s10d
12	Holiday	. . .	30 13/16	84s11½d	16	4.85⅞	66⅞	30⅞	84s10d
13	4.85⅞	66¾	30 13/16	84s 9¾d	17	4.85⅞	66⅝	30 11/16	84s10d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Western producers. In New York, it might be possible to shade 9.15c. on an attractive order. The St. Louis market declined after the A. S. & R. cut, reaching 9c. on Monday. This price was quoted by several sellers, and there seems little justification for any higher quotation, except possibly for small lots of spot lead, which no one seems to need. In fact, a little lead was sold on Monday as low as 8.975c., St. Louis.

Zinc Close to 7½c.

The zinc market has been particularly quiet all week, and price concessions have had to be made to tempt any buying at all. At present levels, about 7.55c. today for all deliveries, most of the pressure to sell seems to have been taken off the market, and were London to show any strength, higher quotations would probably result here immediately. High-grade commands 9½c., delivered in the East.

Tin Has One Active Day

Monday was the only day of the week on which much tin was sold, and a good deal of that was for the account of London houses rather than to consumers. Prices, however, have been well maintained, owing to the excellent statistical position of the metal. Spot tin is very scarce. May shipment has been obtainable at concessions of from 1¼ to 1½c. from early deliveries.

Francs Sag Further

Francs touched a new 1926 low yesterday. Closing cable quotations on Tuesday, Feb. 16, were: francs, 3.6325c.; lire, 4.0375c.; and marks, 23.81c. Canadian dollars, ⅜ per cent discount.

Silver at New Low

After remaining steady although quiet for the past week, silver dropped to a new low both here and abroad on Feb. 17. China holidays, on account of their New Year, were responsible for the dullness, and sales from that quarter brought about the decline in London. Lower prices have developed a little more interest in New York, but the basis for this inquiry is not known.

Mexican Dollars: Feb. 11th, 51⅛c.; 12th, Holiday; 13th and 15th, 51c.; 16th and 17th, 51⅛c.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, 98 per cent, £118 per long ton.

Antimony—Per pound, duty paid, New York: Chinese brands, spot, 22@21½c. February arrival, 19½@19¼c. Cookson's "C" grade, spot, 23½c. Market quiet but firm.

Bismuth—$3.30@$3.35 per lb., in ton lots. London, 12s. 6d.

Cadmium—60c. per lb. London, 1s. 9d. for Australian metal.

Iridium — $325@$340 per oz. for 98@99 per cent. Nominal. London, £70@£75 for 99.5 per cent.

Nickel—Ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent); London, £170@£175 per long ton.

Platinum—$115 per oz. refined officially quoted. Sales also at $108.50@$110. Crude, $108@$109. London, £23@£24 for refined; crude, £21@£22.

Quicksilver—Per 75-lb. flask: $87.50@$88 for spot and forward. San Francisco, $88.67. London, £15.

The prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmium, Palladium, Radium, Rhodium, Ruthenium, Selenium, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of Feb. 6.

Metallic Ores

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $12@$12.50; Western scheelite, $12.50@$13. Domestic demand very light, and prices largely nominal. European demand good.

Chrome Ore, Galena and Pyrite Radio Crystals, Iron Ore, Manganese Ore, Molybdenum, Tantalum, and Vanadium Ores are unchanged from quotations in the Feb. 6 issue.

Zinc Blend and Lead Ore Prices Again Lower

Joplin, Mo., Feb. 13, 1926

Blende	Per Ton
High	$58.85
Premium blende, basis 60 per cent zinc	$51.00@$52.00
Prime Western, basis 60 per cent zinc	$50.00
Fines and slimes, basis 60 per cent zinc	$49.00@$47.00
Average settling price, all zinc	$53.78
Galena	
High	$122.00
Basis 80 per cent lead	$117.50
Average settling price, all lead	$116.83

Shipment for the week: Blende, 20,569; lead, 3,638 tons. Value, all ores the week, $1,541,730.

Production this week has exceeded 19,000 tons, and there was sold for next week's delivery 18,300 tons of blende. As all purchases carry a 10 per cent overload, the full production will be taken up in next week's shipment.

Sellers no longer feel so certain of advancing prices and are selling on the market, both zinc and lead.

Platteville, Wis., Feb. 13, 1926

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$55.50
Lead Ore	
Lead, basis 80 per cent lead	$117.50

Shipments for the week: Blende, 1,057 tons; lead, 40 tons. Shipments for the year: Blende, 5,540; lead, 180 tons. Shipments for the week to separating plants, 2,190 tons blende.

Non-Metallic Minerals

Amblygonite, Andalusite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomaceous Earth, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli and Zircon are unchanged from prices in the Feb. 6 issue.

Mineral Products

Arsenious Oxide (White arsenic)—3@3¼c. per lb. Nominal. London, £14@£15 per long ton.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and Zinc Oxide are unchanged from prices in the Feb. 6 issue.

Ferro-Alloys

Ferrocerium, Ferrochrome, Ferromanganese, Ferrophosphorus, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium and Ferrovanadium are unchanged from prices in the Feb. 6 issue.

Metal Products

Rolled Copper—Sheets, 22¾c.; wire, base price, 16c. per lb.

Lead Sheets—Full, 13c. per lb.; cut, 13¼c.

Nickel Silver—29¾c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal — Dimension sheets, 20¼c. per lb.; rods, 17⅛c.

Zinc Sheets—12c. per lb., f.o.b. works.

Refractories

Chrome Brick, Firebrick, Magnesite Brick, Silica Brick, and Zirkite are unchanged from prices in the Feb. 6 issue.

Steel Steady—Pig Iron Dull—Coke Lower

Pittsburgh, Feb. 16, 1926

Steel-mill operations are running only a trifle lighter than in January, which showed an ingot producing rate exceeded only twice, in March, 1924, and March, 1925. As steel consumption promises to continue, the augury is for at least moderately heavy mill operations for several months. Common prediction leaves next summer as the uncertain period.

The ending of the anthracite suspension will increase steel consumption in certain directions. Blast furnaces have not suffered to any important extent from coke scarcity, when so much coke was going to the East, at fancy prices, as an anthracite substitute, since nearly all the furnace coke needed was under contract for the current quarter at moderate prices.

Steel quotations are unchanged all along the line, except for the recent weakening from asking prices in sheets, which are, however, still well above the level of last October, and for a gradual weakening in plates, which now leaves that line where it was at the beginning of November, the recent slight advance being lost.

Pig Iron — Market dull. With the anthracite suspension ended, pig-iron consumers have an opportunity to observe whether the plentiful supply of coke in near prospect is to make any difference in prices. Furnacemen contend that it will not. Bessemer, $21; basic, $20; foundry, $20.50, f.o.b. Valley furnaces.

Connellsville Coke—Values have been dropping rapidly since the anthracite settlement was announced, and no definite market has yet been developed. Monday morning some furnace coke sold at $5.50, for run-of-oven, the top price, paid recently, having been $12.50.

Company Reports

Utah Copper Increased Earnings in Fourth Quarter

The Utah Copper Co. during the fourth quarter of 1925 maintained production at the same rate as in previous quarters, but earnings increased, according to the report just issued. Total net production of copper from all sources for the quarterly periods of 1925 follows:

	Pounds Copper	Monthly Average
First quarter.....	53,708,682	17,902,894
Second quarter.....	53,409,289	17,803,096
Third quarter.....	53,597,545	17,865,848
Fourth quarter.....	53,446,623	17,815,541

During the last quarter the Arthur plant treated 1,468,300 dry tons of ore and the Magna plant 1,708,400 dry tons, a total for both plants of 3,176,700. Average grade of ore treated at the mills was 0.99 per cent copper and average mill recovery of copper in the form of concentrates was 88.24 per cent of that contained in the ore, compared with 0.99 per cent copper and 86.76 per cent recovery, respectively, for the previous quarter.

Average cost per pound of net copper produced, including depreciation of plant and equipment and all fixed and general expenses and after crediting gold, silver, and miscellaneous earnings, was 8.6c., compared with 8.7c. for the preceding quarter, computed on the same basis.

The following tabulation shows the financial results of the company's operations for the quarter, compared with the previous quarter:

	Fourth Quarter	Third Quarter
Net profit from copper production.....	$2,812,489.70	$2,457,806.78
Miscellaneous income, including gold and silver	651,736.88	664,667.96
Bingham & Garfield Railway Co. dividend...	75,000.00	75,00.00
Nevada Consolidated Copper Co. dividend...	* 250,125.00	.....
Total income.....	$3,789,351.58	$3,197,474.74
Depreciation.....	311,648.35	302,802.21
To surplus.....	$3,477,703.23	$2,894,672.53

Total capping removed during the quarter was 1,969,900 cu.yd., compared with 1,978,018 cu.yd. for the previous quarter. The ore-delivery department transported a total of 3,338,864 tons of ore, being an average of 36,292 tons per diem, compared with 3,376,503 tons total and 36,701 tons daily average for the previous quarter.

Sulphide Corporation Netted £183,289 in 1925

The annual report of the Sulphide Corporation, Ltd., operating at Broken Hill and elsewhere in Australia, for 1925 shows that steps taken toward isolating the fire area in the southern section of the Central mine have proved effective, and considerable progress was made in the work of reopening the northern section, with the result that a substantial and increasing quantity of ore is now being raised from that part of the mine. For the last year, however, except for a small tonnage recovered during reopening operations, no ore was raised from the Central mine. Operations at the Junction mine continued uninterruptedly throughout the year, the quantity of ore raised from the mine having been 37,685 tons of better grade than in 1924.

The lead and zinc milling plants at the Central mine, which were in continuous operation during 1925, treated 37,534 tons of crude ore and 21,104 tons of dump slimes.

The following statement gives the total production from the concentrating mills for the year ended June 30, 1925:

Tonnage Treated	Production Tons	Assay Silver, Oz.	Assay Lead, Per Cent	Assay Zinc, Per Cent	Recoveries Per Cent Silver	Recoveries Per Cent Lead	Recoveries Per Cent Zinc	Cost per Ton Concentrates
Crude Ore 37,534	10,273 Lee concentrates	41.4	56.8	12.7				£14 18 3
	2,230 Special slimes	14.0	17.6	8.3				
Dump slimes 21,104	11,346 Zinc concentrates	10.0	7.1	48.5	88.7	86.2	91.2	
	502 Zinc slime concentrates	11.8	7.4	47.8				£ 1 16 3

Supplemental to the foregoing there were treated in the Broken Hill Proprietary Co.'s plant 21,729 tons of Central mine dump slimes and 2,974 tons of Junction mine crude ore, for an extraction of 5,006 tons of lead concentrates and 6,392 tons of zinc concentrates. All of the lead concentrates and special slimes produced during the year were disposed of to the Broken Hill Associated Smelters Proprietary Co., Ltd., and the zinc concentrates through the Zinc Producers' Association Proprietary, Ltd., under existing arrangements.

As the result of conferences between the Broken Hill companies and representatives of the Industrial Unions, agreements were reached whereby wages and working conditions were settled for a period of three years from Jan. 1, 1925.

At the Cockle Creek works operations proceeded without interruption throughout 1925, and increased production was attained, both of sulphuric acid and superphosphates, the figures being 15,822 tons of acid (mono) against 13,560 tons (mono) in the previous year, and 29,074 tons superphosphates against 19,192 tons.

With a view to meeting a larger demand for acid and providing for an increase in the superphosphate production, the erection of a second unit of the contact acid plant has been started.

During the period under review a hydrochloric acid plant was installed and operated as from Jan. 1 with a production of seventy-seven tons of this acid, for which a ready market was found.

The zinc roasting plant erected by the Electrolytic Zinc Co. of Australia, Ltd., was constantly employed, and the gases produced were utilized for the production of sulphuric acid.

The Central Zinc and Acid Works at Seaton Carew remained in continuous operation throughout the year, the zinc distillation plant having worked without interruption on an average eight-furnace basis. Production of spelter shows an important increase over that of the previous year, and but for the fact that ore supplies under the contract with the Board of Trade were considerably restricted, this increase would have been still greater.

Working Account for Year Ended June 30, 1925

Debit

	£	s.	d.
Ore concentrates and other products			
On hand in England and Australia, June 30, 1924.....	91,334	10	2
Central and Junction mines			
Wages, development and maintenance.....	240,307	18	4
Cockle Creek			
Wages and maintenance.....	191,799	10	1
Central Zinc and Acid Works			
Wages, purchased ores, and maintenance.....	230,647	6	10
	754,089	5	5
Balance transferred to profit-and-loss account.....	183,289	7	0
	937,378	12	5

Credit

	£	s.	d.
Sales of products.....	889,513	15	0
Ore, concentrates and other products			
On hand, June 30, 1925, England and Australia.....	47,864	17	5
	937,378	12	5

Calumet & Hecla "Broke Even" in Fourth Quarter

Salient features of the financial results of the operations of the Calumet & Hecla Consolidated Copper Co. during 1925 are shown in the accompanying table. The company operates in the Michigan copper country. For the quarter ended Dec. 31, 1925, profit, after depreciation and depletion, amounted to $75,485, compared with loss of $35,210 in preceding quarter, and loss of $894,775 in last quarter of 1924. Loss for the year 1925, as computed from the quarterly returns, totaled $436,676, compared with loss in 1924 of $1,634,438. Income account follows:

	Year 1925	Year 1924
Gross income.....	$14,450,830	$9,580,741
Expense, taxes, depreciation and depletion.....	14,887,506	11,215,179
Net loss.....	$436,676	$1,634,438

	Fourth Quarter 1925	Fourth Quarter 1924
Gross income.....	$4,863,619	$2,425,321
Expense, taxes, depreciation and depletion.....	4,788,134	3,320,096
Net profit.....	$75,485	(a) $894,775

(a) Loss.

Mount Lyell Copper Production Fell in 1925

The report of the directors of the Mount Lyell M. & R. Co., operating in Tasmania, for the year ended Sept. 30, 1925, shows that from the North Mount Lyell mine production was 117,024 tons, of which 4,224 tons of high-grade was sent direct to the converting plant and 112,800 to the concentrator. The average assay value of the whole of the ore was 6.06 per cent copper, 1.06 oz. silver, and 0.020 oz. gold.

Work in connection with the raising of the Mount Lyell block shaft through to the surface, for facilitating the efficient and economical working of the lower levels, made good progress during the year, and it is anticipated that the shaft will be finished before the end of the current financial year.

Ore reserves of the North Mount Lyell mine have been recalculated, and as at Sept. 30, 1925, are estimated as follows:

	Average Assay		
Tons Dry	Copper Per Cent	Silver Oz.	Gold Oz.
1,006,426	6.0	1.33	0.015

These figures show that during the last two years the accession to the reserves has been greater than the tonnage extracted. In view of the extent to which development work has been limited for several years past, this result is eminently satisfactory.

The concentration plant treated 112,503 tons of ore from the North Mount Lyell mine, and produced 34,076 tons of concentrates. Blister copper produced amounted to 6,542 tons, compared with 7,097 tons for the year ended Sept. 30, 1924, the latter including 867 tons recovered from ore won and concentrated during the preceding term. The concentrating, sintering, smelting and converting plants all operated well during the period covered by the report, and the total metal recoveries were highly satisfactory, being 92.73 per cent copper, 83.56 per cent silver, and 84.61 per cent gold.

Under the awards of the Commonwealth Arbitration Court the rates of wages at Mount Lyell again show increases, the basic wage being now 79s. per week, an increase of 3s. 6d. per week, compared with the rate at the date of last report.

Working Account, Year Ended Sept. 30, 1925

Debit

	£	s.	d.
Mining charges	143,340	2	7
Ore concentration	79,149	14	7
Smelting expenses	76,970	16	0
Converter expenses (Bessemerising)	11,813	15	2
Railway traffic expenses, maintenance, management and repairs	29,065	10	4
Freight and charges on copper	74,493	0	5
Balance to profit-and-loss account	211,925	13	0
	626,758	12	1

Credit

	£	s.	d.
Blister copper and chemical works account	596,468	1	5
Railway traffic revenue	30,290	10	8
	626,758	12	1

New Jersey Zinc Co. Income Increased in 1925

During 1925, according to the current annual report, the New Jersey Zinc Co. netted $6,888,318 after depreciation, taxes and interest charges, equivalent to $14.03 a share earned on $49,081,600 capital stock. This compares with $6,405,643 or $13.05 a share in 1924. Net income for quarter ended Dec. 31, 1925, was $1,918,556, comparing with $1,758,426 in the preceding quarter.

The consolidated income account for 1925 compares as follows with 1924:

	1925	1924
Income (a)	$7,048,318	$6,565,643
Interest	160,000	160,000
Net income	$6,888,318	$6,405,643
Dividends	5,889,792	4,906,160
Profit share	450,000	340,000
Surplus	$548,526	$1,159,483

(a) Includes dividends from subsidiaries, and is after deduction of expenses, taxes and depreciation.

Dome Profits $2,053,000 for 1925

The official statement accompanying the dividend checks of Domes Mines, Ltd., shows that for the year ending Dec. 31, 1925, 530,200 tons of ore was treated, the production being $4,366,025; operating costs were $4.467 per ton and net profits, before depreciation, $2,053,000, against $2,151,000 in the preceding year.

Texas Gulf Sulphur Earned $5,689,241 in 1925

Following is the financial statement of the Texas Gulf Sulphur Co. for the year 1925:

Income Account for Year Ended Dec. 31

Gross income	$11,973,617.29
Total cost of sales and other expenses, including taxes	6,284,375.73
Profit and loss surplus for period	$5,689,241.56
Add surplus at beginning of period	7,107,284.02
	$12,796,525.58
Deduct dividends 14, 15, 16, and 17	5,556,250.00
Total surplus carried to balance sheet	$7,240,275.58

Balance Sheet As of Dec. 31

Assets		
Property and plants at cost		
Lands and development	$2,959,875.92	
Plants, buildings, machinery and equipment	5,987,963.47	
		$8,947,839.39
Working and trading assets at cost		
Materials, supplies and sulphur inventories		6,343,275.49
Current assets		5,019,552.27
Deferred assets		21,870.50
		$20,332,537.65

Liabilities and Capital

Capital stock—Authorized, issued and outstanding, 635,000 shares at $10 par value	$6,350,000.00
Current liabilities	
Accounts payable and taxes accrued	458,952.04
Reserves, including reserve for depreciation and for unpaid federal taxes	6,283,310.03
Surplus, including reserve for depletion	7,240,275.58
	$20,332,537.65

Butte Copper & Zinc Earned $378,949 in 1925

Increased earnings are reported by the Butte Copper & Zinc Co., operated by the Anaconda Copper Mining Co., for 1925. The following table shows the financial position of the company during the last three years:

	1925	1924	1923
Ore receipts	$454,397	$155,951	$103,664
Depreciation	10,000	10,000	10,000
Balance	$444,397	$145,951	$93,664
Other income	26,135	32,436	22,354
Total income	$470,532	$178,387	$116,018
Expenses and taxes	91,583	45,275	40,697
Net income	$378,949	$133,112	$75,321

Automobile Manufacturers Big Copper Users in 1925

The following estimates of the American Bureau of Metal Statistics afford a fairly accurate idea of the trend of domestic copper consumption. The totals of the different kinds of consumption enumerated represented 53.94 per cent of the total domestic consumption in 1924. Figures are in tons of 2,000 lb.

	1924		1925				
	Fourth Quarter	Total 1924	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total 1925
Elec. mfg.	45,000	195,500	45,000	42,500	43,000	53,000	183,500
Automobiles	20,900	93,700	25,475	32,000	27,200	28,750	113,425
Buildings	8,550	40,450	9,250	9,550	13,500	14,400	46,700
Ships	450	2,100	500	550	700	350	2,100
Locomotives	850	3,350	550	600	500	550	2,200
Ry. cars	1,950	7,150	2,525	2,325	1,350	950	7,150
Ry. bearings	4,350	16,550	3,900	4,100	4,300	4,500	16,800
Mfg. for export	12,900	54,100	13,400	15,850	14,350	14,250	57,850
Total	94,950	412,900	100,600	107,475	104,900	116,750	429,725
Domestic deliv. from prim. ref.	175,206	753,389	191,771	194,177	214,618	230,605	831,171

Mining Stocks—Week Ended February 13, 1926

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	51	49⅛	49¼	Ja.16,Fe.23,Q	0.75
Arcadian Consol.	Boston	*65	*65	*65	.....	.....
Ariz. Com'l.	Boston	12⅜	11⅞	12⅛	Jy.21, Jy. 31 SA	0.50
Calaveras	N. Y. Curb	3⅛	3⅛	3⅞	.....	.....
Calumet & Arizona	New York	63¾	61	62⅛	De.4, De.21 QX	1.50
Calumet & Hecla	Boston	15⅞	14⅝	15	Nov.30,De.15 Q	0.50
Cerro de Pasco	New York	69⅛	63⅛	67⅜	Ja. 14, Fe. 1, Q	1.00
Chile Copper	New York	35¼	35	35¼	Ma.3,Ma.29,Q	0.62½
Chino	New York	21⅛	18⅝	21⅛	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	2⅛	1⅞	1⅞	.....	.....
Copper Range	Boston	20	19½	19⅞	May, 1925	1.00
Crystal Copper	Boston Curb	*60	*46	*57	.....	.....
East Butte	Boston	4	3⅛	4	Dec., 1919	0.50
First National	Boston Curb	*20	*18	*20	Feb., 1919	0.15
Franklin	Boston	*90	*80	*80	.....	.....
Granby Consol.	New York	23⅛	22	22	May, 1919	1.25
Greene-Cananea	New York	14¼	12⅛	14⅛	Nov., 1920	0.50
Hancock	Boston	...	...	*80	.....	.....
HoweSound.new,r.t.c.	New York	31⅛	30	31	Ja. 5, Ja. 15 Q	0.50
Inspiration Consl.	New York	26⅜	25⅛	26	De.17, Ja.4, Q	0.50
Iron Cap	Boston Curb	2⅛	2⅛	2⅛	May, 1923	0.15
Isle Royale	Boston	13	12⅝	12⅞	No.30, De.5	1.00
Jerome Verde Dev.	N. Y. Curb	1⅜	1⅜	1⅜	.....	.....
Kennecott	New York	58⅛	56⅞	57⅛	Ma.5,Ap.1 Q	1.00
Lake Copper	Boston	1⅛	1	1⅛	June, 1925	0.50
Magma Copper	New York	44⅜	44	44⅛	De.31, Ja.15,	0.75
Mason Valley	N. Y. Curb	2⅛	2⅛	2⅛	.....	.....
Mass Consolidated	Boston	*70	*40	*70	Nov., 1917	1.00
Miami Copper	New York	13⅛	12⅛	12⅞	Feb.1, Feb.15 Q	0.25
Mohawk	Boston	37	34	34½	Jan. 30, Ma.1 Q	1.00
Mother Lode Coa.	New York	7⅛	7	7⅛	De. 11, De. 31	0.37½
Nevada Consol.	New York	13⅜	13⅛	13⅜	De. 18, De.31 Q	0.25
New Cornelia	Boston	21⅛	20⅛	21⅛	Fe.5, Fe.23 Q	0.30
North Butte	Boston	3⅛	2⅞	3⅛	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*74	*66	*66	No. 14, De. 2	0.05
Old Dominion	Boston	19⅛	18⅛	19	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†130	†128	...	De.21, Ja.2 Q	1.00
Quincy	Boston	21⅞	20⅛	21⅛	Mar., 1920	1.00
Ray Consolidated	New York	12⅛	12⅛	12⅞	Dec., 1920	0.25
Ray Hercules	N. Y. Curb	...	...	11⅞	.....	.....
St. Mary's Min. Ld.	Boston	38	36½	36½	May, 1925	3.00
Seneca Copper	New York	8⅜	8⅛	8⅜	.....	.....
Shannon	Boston	*70	*65	*65	Nov., 1917	0.25
Shattuck Arizona	New York	66	63	65⅜	Jan., 1920	0.25
Superior & Boston	Boston	*90	*80	*90	.....	.....
Tenn. C. & C.	New York	15⅞	15⅛	15⅞	Fe.27,Ma.15,Q	0.25
United Verde Ex.	N. Y. Curb	33	29⅞	32	Ja.5, Fe.1, Q	0.75
Utah Copper	New York	100	100	100	De.18, De.31,Q	1.25
Utah Metal & T.	Boston	1⅛	1⅛	1⅛	Dec., 1917	0.30
Victoria	Boston	*45	*45	*45	.....	.....
Walker Mining	Salt Lake	1.40	1.20	1.30	.....	.....
NICKEL-COPPER						
Internat. Nickel	New York	44¾	42¾	43½	De.17,De.31,Q	0.50
Internat. Nickel, pfd.	New York	....	....	102¾	Ja.25, Fe.1, Q	1.50
LEAD						
Gladstone M. M. Co.	Spokane	*36½	*36	*36	Ja. 1, Ja. 10 M	0.01
National Lead	New York	....	....	168	De.11, De.31 Q	2.00
National Lead pfd.	New York	117½	117	117½	Aug.21, Se.15	1.75
St. Joseph Lead	New York	48⅛	45¼	47	De.10,De.20QX	1.50
ZINC						
Am. Z. L. & S.	New York	11⅛	10	10	May., 1920	1.00
Am. Z. L. & S, pfd.	New York	46½	41⅜	41⅜	Nov., 1920	1.50
Butte C. & Z.	New York	6½	6	6½	De.10, De.24	0.50
Butte & Superior	New York	15⅜	14½	15	De.15, De.31 Q	0.50
Callahan Zn-Ld	New York	2⅛	2	2⅛	Dec., 1920	0.50
Eagle Picher	Cincinnati	34	33⅛	33⅝	Fe. 15, Mar.1	0.40
Eagle Picher, pfd.	Cincinnati	...	...	110	Ja.1, Ja.31	1.50
New Jersey Zn.	N. Y. Curb	...	...	208	No.20, De.10 X	2.00
United Zinc	N. Y. Curb	...	...	*70	.....	.....
Yellow Pine	Los Angeles	†40	†25	....	De.8, De.18 Q	0.04
GOLD						
Alaska Juneau	New York	....	....	1⅜	.....	.....
Argonaut	Toronto	*23¼	*20½	*20⅝	.....	.....
Barry-Hollinger	Toronto	*45	*34	*43	.....	.....
Carson Hill	Boston	*45	*45	*45	.....	.....
Consol. W. Dome L.	Toronto	*29½	*24	*27½	.....	.....
Cresson Consol. G.	N. Y. Curb	2⅛	2⅛	2⅛	De.31, Ja. 7	0.10
Crown Reserve	Toronto	*24	*20	*20½	Jan., 1917	0.05
Dome Mines	New York	19	18	18⅝	De.31, Ja.20, Q	0.50
Golden Center	N. Y. Curb	2⅛	2	2⅛	.....	.....
Golden Cycle	Colo. Springs	†1.55	†1.53	....	No.30, Dec.10 Q	0.03
Hollinger Consol	Toronto	20.00	18.90	19.80	Fe. 9, Fe. 25	0.08
Homestake Mining	New York	55	51	55	Fe.20,Fe.25 Mo	0.50
Kirkland Lake	Toronto	1.38	1.16	1.38	.....	.....
Lake Shore	Toronto	12.80	12.10	12.60	De.1,De.15 XQ	0.10
McIntyre-Porcupine	New York	27⅜	24½	27⅜	Fe.1, Ma.7	0.05
Newray	Toronto	*42	*40	*42	.....	.....
Night Hawk Pen	Toronto	*17⅞	*16½	*16½	.....	.....
Noranda	N. Y. Curb	*17	*10	*12½	.....	.....
Portland	Colo. Springs	†*63½	†*59½	....	Oct., 1920	0.01
Rand Mines	New York	...	...	34⅜	Au.17, Au.25	1.52
Teck-Hughes	Toronto	3.79	3.69	3.75	Ja. 15, Fe. 1	0.05
Tom Reed	Los Angeles	*50	*50	*50	Ma.10Ma.20	0.02
Tough-Oakes	Toronto	*64	*55	*59	.....	.....
United Eastern	N. Y. Curb	*43	*43	*43	July, 1924	0.05
Vipond Cons.	Toronto	1.97	1.93	1.94	.....	.....
Wright-Hargreaves	Toronto	9.40	9.05	9.20	De.15, Ja. 1 QX	0.10
Yukon-Alaska Trust	N. Y. Curb	....	....	20¼	.....	.....
GOLD AND SILVER						
Carnegie Metals	Pittsburgh	20½	17	20	.....	.....
Con. Cortez	N. Y. Curb	*7	*6	*6	.....	.....
Con. Virginia	San Francisco	*19½	*15½	*15½	.....	.....
Continental Mines	N. Y. Curb	...	...	*45	.....	.....
Dolores Esperanza	N. Y. Curb	...	...	*71	July, 1923	0.05
Premier Gold	N. Y. Curb	2⅜	2⅛	2⅜	De.18, Ja. 4	0.08
Tonopah Belmont	N. Y. Curb	4⅜	3⅜	4⅜	Se.15, Oc.1	0.05
Tonopah Extension	N. Y. Curb	*70	*56	*62	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	7⅛	6	7⅛	Se.30, Oc.21	0.07½
Unity Gold	N. Y. Curb	...	...	*20	.....	.....
West End Consol.	N. Y. Curb	...	...	*24	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	*50	*50	*50	June, 1918	0.02

Stock	Exch.	High	Low	Last		Last Div.
SILVER						
Alvarado	N. Y. Curb	...	...	1	Oct., 1920	0.50
Beaver Consol	Toronto	*96	*81	*91	May. 1920	0.03
Castle-Trethewey	Toronto	1.69	1.61	1.69	.....	.....
Coniagas	Toronto	4.35	3.85	4.20	May, 1924	0.12½
Keeley	Toronto	1.81	1.74	1.75	Ma.1,Ma.15 X	0.12
Kerr Lake	N. Y. Curb	1⅛	1⅛	1⅛	Oc. 1, Oc.15 Q	0.12½
La Rose	Toronto	*33	*30	*30	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	*98	*98	*98	Jy. 2, Jy. 15	0.05
McKinley-Dar.-Sav.	Toronto	*24	*23	*24	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.90	3.80	3.88	Ja. 16, Ja.30	0.12½
Nipissing	N. Y. Curb	6⅛	6⅛	6⅜	De.31, Ja.2, Q	0.15
Temiskaming	Toronto	1	1	1	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York	8⅜	8	8	De.15,Ja.2, X	0.25
Alta Merger	Salt Lake	†3½	†1	...	.....	.....
Bingham Mines	Boston	53	52½	53	Ma.20,Ma.31 Q	1.00
Cardiff M. & M.	Salt Lake	*58	*58	*58	De.16, No.18	0.10
Chief Consol.	Salt Lake	3.35	3.30	3.35	Fe. 1,	0.10
Emma Silver	Salt Lake	†2	†1½	...	.....	.....
Erupcion	Boston Curb	1⅜	1⅜	1⅜	De.15, Ja.2, X	0.10
Federal M. & S.	New York	104	100	100	.....	.....
Federal M. & S., pfd.	New York	91½	89	89	No.25, De.15 Q	1.75
Hawthorne Mines	N. Y. Curb	*30	*23	*27	.....	.....
Hecla Mining	N. Y. Curb	18⅛	18	18⅜	No.15, De.15 Q	0.50
Iron King Mining	Salt Lake	...	...	*35	.....	.....
Keystone Mining	Salt Lake	*60	*55	*60	Au.12, Au.26	0.07½
Lucky Jim	Spokane	*14¾	*14½	*14¾	.....	.....
Mammoth Mining	Salt Lake	2.95	2.92½	2.92½	De. 16, De. 23	0.10
Marsh Mines	Spokane	*9⅛	*8½	*8½	Se.15, Oc.1	0.15
Ontario Silver	New York	...	...	10	.....	.....
Park Utah	Salt Lake	8.40	8.25	8.25	Se.15, Oc.1	0.15
Prince Cons	Salt Lake	1	1	1	.....	.....
Silver King Coal	Salt Lake	9.30	9.30	9.30	De.15, Ja.2, QX	0.35
Silversmith	Spokane	*42	*39½	*42	De.31, Ja.10	0.02
Tamarack-Custer	Spokane	*57	*48	*51	Sept., 1924	0.25
Tintic Standard	Salt Lake	13.50	13.00	13.50	De.16,De.23,QX	0.30
Utah-Apex	Boston	11⅛	10⅞	10⅞	Ja.1, Ja.5, Q	0.35
Western Utah Copper	N. Y. Curb	...	...	*8	.....	.....
IRON						
Bethlehem Steel	New York	47⅛	46⅛	46⅛	July, 1924	1.25
Colorado Fuel & Iron	New York	38⅛	35⅛	36⅛	May, 1921	0.75
Gt. North'n Iron Ore	New York	27	26	27	De. 4, De. 28,	0.75
Inland Steel	New York	40⅛	39	39⅛	Fe.15, Ma.1 Q	0.62½
Mesabi Iron	N. Y. Curb	...	...	2	.....	.....
Replogle Steel	New York	13⅜	13⅛	13⅜	.....	.....
Republic I. & S.	New York	57⅛	55⅛	55⅛	May, 1921	1.50
Republic I. & S. pfd.	New York	94⅜	94⅛	94⅛	Ma.15, Ap.1, Q	1.75
Sloss-Sheffield S. & I.	New York	132	125	127	De.10, Dc.21 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	...	...	102	De.21, Ja.2, Q	1.75
U. S. Steel	New York	133⅛	121⅛	131⅞	Fe.27, Ma.30 XQ	1.75
U. S. Steel pfd.	New York	126⅝	126	126⅛	Fe. 3, Fe. 27, Q	1.75
Virginia I. C. & C.	New York	43	43	43	Jan., 1924	1.50
Virginia I.C.&C.pfd	New York	...	...	77	De.15, Ja.2,	2.50
VANADIUM						
Vanadium Corp.	New York	32⅛	31⅛	31⅞	Fe.1, Fe.15, Q	0.50
ASBESTOS						
Asbestos Corp.	Montreal	92½	92	92	De.31, Ja.15 Q	1.50
Asbestos Corp., pfd.	Montreal	116	115	115	De.31, Ja.15, Q	1.50
SULPHUR						
Freeport Texas	New York	28⅜	26⅛	26⅜	Nov., 1919	1.00
Texas Gulf	New York	142	138½	139½	De.1, De.15,QX	2.75
DIAMONDS						
De Beers Consol	New York	...	...	29	Ja.26, Fe.2	0.23
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	4⅛	3⅞	4⅛	.....	.....
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	56¾	54½	56⅛	Fe.18, Ma. 1, Q	1.00
Amer. Metal pfd.	New York	120	119	120	Fe. 19, Ma. 1, Q	1.75
Amer. Sm. & Ref.	New York	143⅜	135⅞	140⅜	Ja.15, Fe.1,	1.75
Amer. Sm.&Ref.pfd.	New York	116½	116	116½	Fe.5,Ma.1, Q	1.75
Consol. M. & S.	New York	220	220	220	De.31, Ja.15	0.75
Federated Metals	N. Y. Curb	21	21	21	.....	.....
Newmont Mining	N. Y. Curb	57	55	57	De.31, Ja.15,	0.60
Southwest Metals	N. Y. Curb	...	...	2	.....	.....
U. S. Sm. R. & M.	New York	48⅜	47⅛	47½	Ja.1, Ja.7, Q	0.87½
U.S. Sm. R.&M.pfd.	New York	49⅜	49	49⅜	Ja.1, Ja.7, Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange and Henry Sachs: Colorado Springs, Colo.

PRICE WEEK ENDED FEBRUARY 3, 1926

Name	High	Low	Last	Last Divd. Date	Amount
Aramayo Mines (25 frs.)	81/3	80/—	80/—	Feb. 1926	5 p.c.†
British Platinum (£1)	7/3	7/—	7/—	Feb. 1925	2½ p.c.
Burma Corpn. (10 rupees)	18/6	17/—	17/6	Feb. 1926	6 annas*
Bwana M'Kubwa (5s)	7/10½	7/3	7/4½		
Camp Bird (£1)	5/3	4/10½	5/1½		
El Oro (£1)	7/—	6/6	6/9	Nov. 1924	2½ p.c.*
Esperanza (10s)	2/1½	1/9	1/9		
Frontino & Bolivia (£1)	8/—	7/6	7/6	Jan. 1926	1½ p.c.
Mexican Corpn. (£1)	22/—	21/3	22/—		
Mexico Mines of El Oro (£1)	38/9	35/—	37/6	Dec. 1925	12½ p.c.*
Nechi (pref. 10s)	1/6	1/—	1/—	1921–22	25 p.c.
Oroville Dredgng (£1)	4/1½	3/7½	4/—	Dec. 1923	3½ p.c.
Ouro Preto (£1)	2/9	2/6	2/9	May 1925	2½ p.c.
St. John del Rey (£1)	10/9	10/3	10/9	June 1925	6½ p.c.
San Francisco Mines (10s)	31/—	30/—	30/9	Jan. 1926	22½ p.c.
Santa Gertrudis (£1)	21/9	20/9	21/6	July 1920	5 p.c.
Selukwe (2s. 6d.)	11/6	10/4½	11/—	April 1917	6¾ p.c.
S. Amer. Copper (2s.)	5/1½	4/9	5/—	Nov. 1917	75 p.c.
Tanganyika (£1)	46/9	42/3	45/—	Sept. 1925	5 p.c.
Tomboy (£1)	3/9	3/6	3/9	Jan. 1926	5 p.c.
Union Miniere du Haut-Katanga (Brussels)	6.400	6.050	6.350	July 1925	150 frs.‡

* Free of British income tax. † Swiss frs. ‡ Belgian frs.